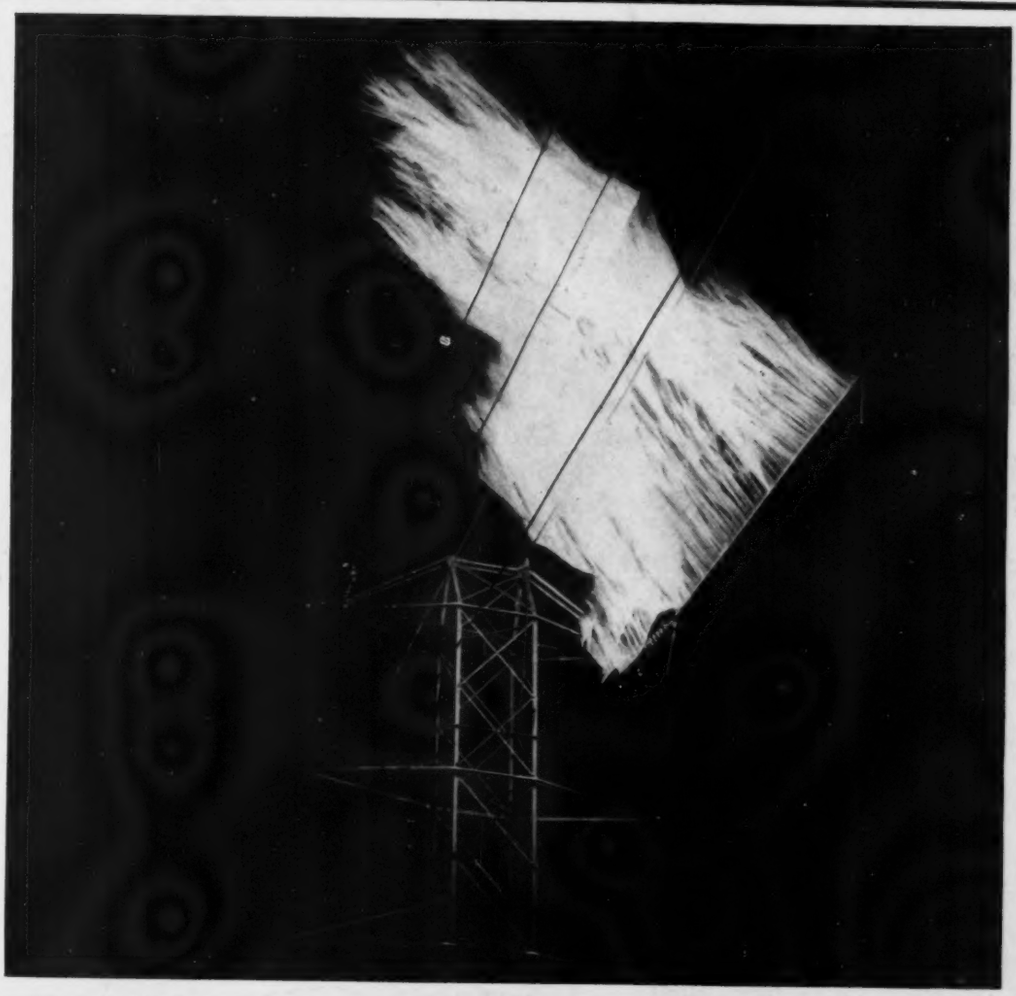
Electrical World

ENGINEERING
LIBRARY



JUNE 8, 1946

Edison Electric Institute Annual
Convention Report Issue

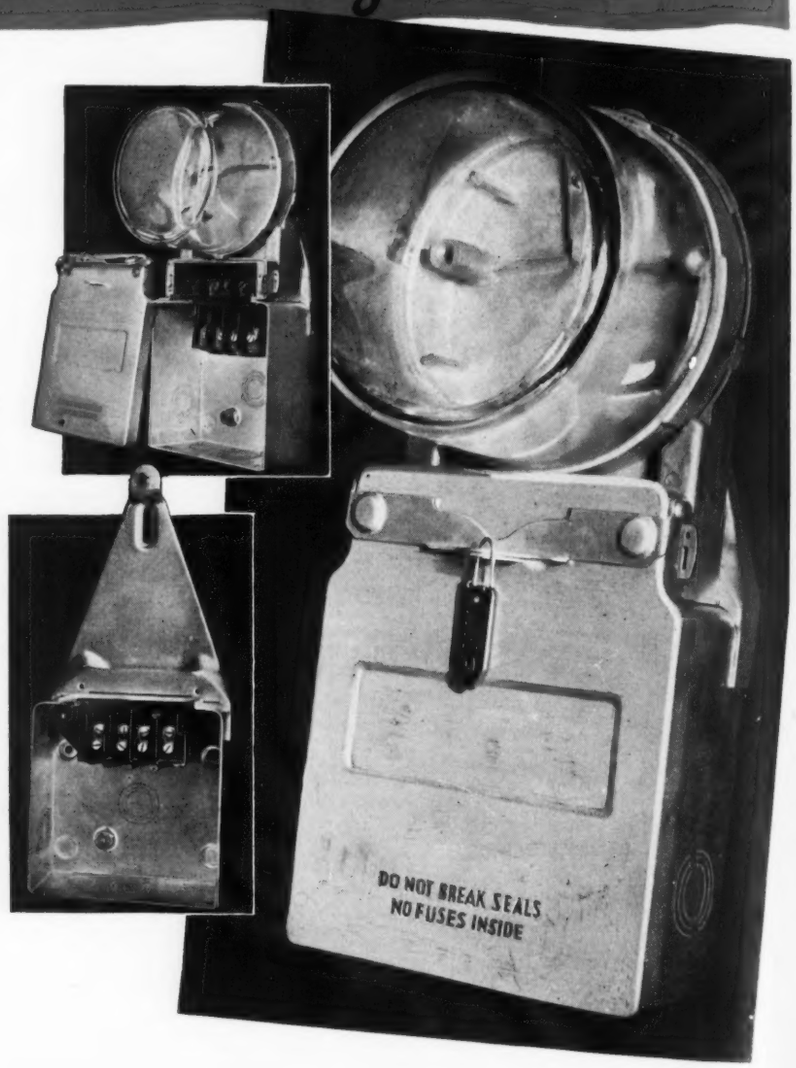
A McGRAW-HILL PUBLICATION

Sturdy reliable

THE Murray "A" Box — modernized

THIS "A" Box is modern—and for indoor and outdoor use. It is rugged and emphatically time-resistant. It accommodates modern, bottom-connected, watt-hour meters. Because of an ingenious arrangement, inherent in the tough case, only one seal is needed. The Murray "A" Box (catalog is number 9600) is generously supplied with knockouts. It occupies standard wall space and has standard mounting holes.

We believe this "A" Box will prove as popular with you as with its many, many users. Metropolitan Device Corporation, Brooklyn 16, N. Y.



Metropolitan
Device Corporation
1250 Atlantic Avenue
Brooklyn 16, New York

Send me informative printed matter on unique Murray "A" Box —no obligation

Name_____

Company_____

Address_____

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 72 YEARS

June 8, 1946 — Vol. 125, No. 23

Contents

EDISON ELECTRIC INSTITUTE ANNUAL MEETING.....70 to 89
The President Reports..... 70
C. W. KELLOGG, Edison Electric Institute
Intensive Selling Is a Trust..... 72
GEORGE W. OUSLER, Duquesne Light Co.
Servicing Electrical Appliances.....73
R. L. WHITE, National Electrical Manufacturers Association
A Utility Man Looks at Atomic Energy..... 74
JOHN C. PARKER, Consolidated Edison Co. of New York, Inc.
Engineering and Political Aspects of Atomic Energy..... 75
H. A. WINNE, General Electric Co.
Basic Factors of Atomic Energy Utilization..... 76
K. H. KINGDOM, General Electric Co.
Relation of Nuclear Research to Electric Power Generation..... 77
C. G. SUITS, General Electric Co.
Planning Distribution for Increased Loads..... 78
FRANK E. SANFORD, Electrical World
J. H. FOOTE, Commonwealth & Southern Corp.
Telephone Service on Rural Lines..... 80
A. E. SILVER, Ebasco Services, Inc.
Farm Electrification 81
G. C. NEFF, Wisconsin Power & Light Co.
Electric Companies Advertising Program..... 82
P. H. McCANCE, Duquesne Light Co.
More Power to America..... 84
W. V. MERRIHUE, General Electric Co.
Productive Power 85
J. M. McKIBBIN, Jr., and C. B. STAINBACK, Westinghouse Electric Corp.
Electric House Heating in the Pacific Northwest..... 86
J. H. POLHEMUS, Portland General Electric Co.
Electric House Heating in the South..... 87
J. M. BARRY, Alabama Power Co.
Towards Better Understanding..... 88
P. L. SMITH, National Association of Electric Companies
Post-War Labor Trends 89
H. K. BRECKENRIDGE, West Penn Power Co.

THE COVER—Spectacular arc from phase to overhead ground on a 110-kv. line of Niagara Hudson system, established during a test. See page 101. Photo by J. Lunn Mowers.

Editorials .....69 and 90
Washington Comment 92
News of the Week..... 93
HOW 101
Engineering Reference Sheets.....104 and 108
Load Building 124
New Equipment 132
Catalogs and Bulletins..... 177
News About People..... 185
Manufacturing and Markets..... 198
Sales Opportunities 204
Recent Rate Changes..... 205
Rural Allotments 206
Book Reviews 207
Letter to the Editor..... 209
Index of Advertisements..... 216

SAMUEL B. WILLIAMS.....*Editor*

ARCHER E. KNOWLTON..*Associate Editor*
FRANK R. INNES.....*Associate Editor*
RUE M. SHOOP.....*Assistant Editor*
JULIUS C. MEIER...*Manufacturing Editor*
DANIEL J. KILKELLY....*Industrial Editor*
KENNETH K. KOST.....*News Editor*
EDNA M. GLENNON.*Assistant News Editor*
DANIEL T. BRAYMER.....*Western Editor*
FRANK E. SANFORD
Associate Western Editor
HOWARD S. KNOWLTON
New England Editor
WALTER C. HESTON..*Pacific Coast Editor*
RICHARD N. LARKIN
Washington Correspondent
DONALD D. HOGATE
Manager, Washington Bureau
DEXTER KEEZER
Director, Economics Department

M. S. MacNAUGHT.....*Manager*

DISTRICT MANAGERS
E. F. COFFEY.....*New York*
N. V. PALMER.....*Boston*
F. P. COYLE.....*Philadelphia*
C. R. LIPPOLD.....*Cleveland*
S. H. BABCOCK.....*Detroit*
W. H. MENEILLEY.....*Chicago*
J. T. SCHAEFER.....*St. Louis*

LEE H. HILL.....*Publisher*

ELECTRICAL WORLD

Published weekly. Price 25 cents a copy. Publication office 99-129 N. Broadway, Albany 1, N. Y. Allow at least ten days for change of address. Address communications about subscriptions to J. E. Blackburn, Jr., Director of Circulation.

RETURN POSTAGE GUARANTEED

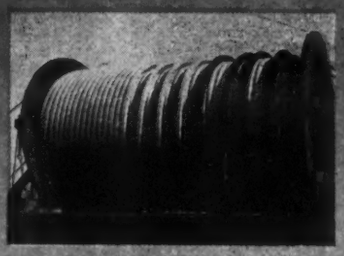
Subscription rates: In the United States, $5 a year, $8 for two years, $10 for three years. Canada $6 for one year, $10 for two years, $12 for three years (Canadian money at par). Pan-American countries $15 for one year, $25 for two years, $30 for three years. All other countries $20 for one year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second class matter November 16, 1936, at Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U.S.A. Contents copyrighted, 1946, by McGraw-Hill Publishing Company, Inc. All Rights Reserved. Branch Offices: 520 North Michigan Avenue, Chicago 11, Ill.; 68 Post Street, San Francisco 4; Aldwych House, Aldwych, London, W.C.2; Atlanta, Ga.; Boston, Cleveland, Detroit, Los Angeles, Philadelphia, Pittsburgh, St. Louis, Washington.

McGRAW-HILL PUBLISHING CO., INC.
JAMES H. McGRAW
Founder and Honorary Chairman

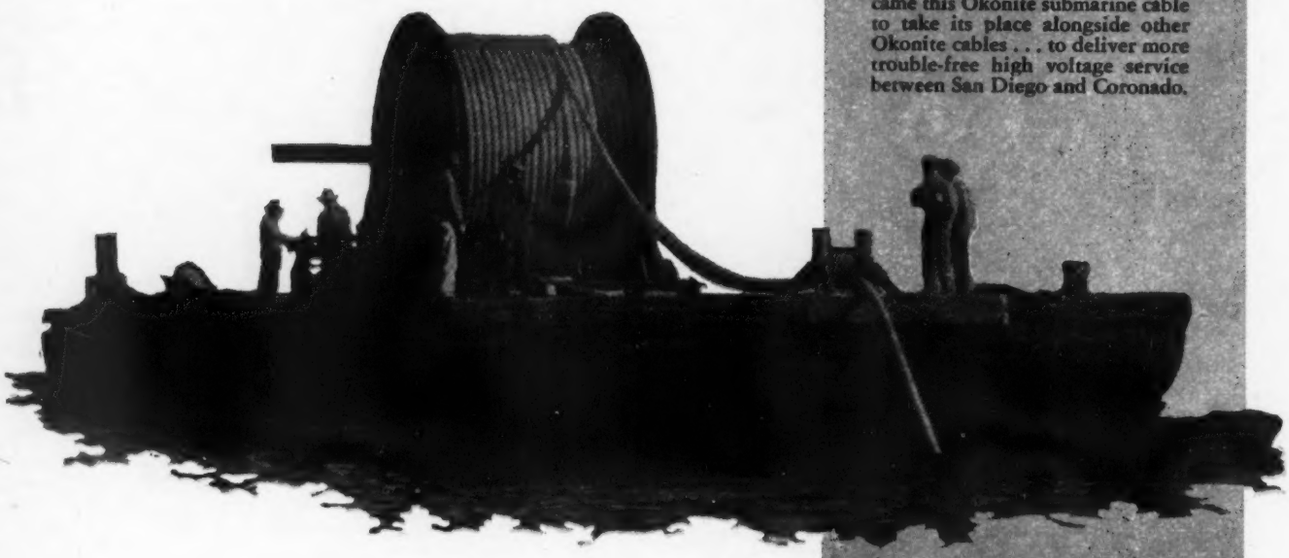
Publication Office .....99-129 N. Broadway, Albany 1, N. Y.
Editorial and Executive Offices....330 West 42nd St., New York 18, N. Y.
JAMES H. McGRAW, JR.....President
CURTIS W. McGRAW.....Senior Vice-President and Treasurer
JOSEPH A. GERARDI.....Secretary
NELSON BOND.....Director of Advertising
EUGENE DUFFIELD.....Editorial Assistant to the President
J. E. BLACKBURN, JR.....Director of Circulation

Member A.B.P. Member A.B.C.
Cable Address McGRAW-HILL, New York

UTILITY LAYS 12,000 VOLT SUBMARINE CABLE IN 10½ MINUTES



ACROSS THE CONTINENT by rail came this Okonite submarine cable to take its place alongside other Okonite cables . . . to deliver more trouble-free high voltage service between San Diego and Coronado.



TWO-WAY RADIO COMMUNICATION between tug and shore was set up by a surveying unit of San Diego Gas and Electric Co. to assure the proper course was followed during laying operations.

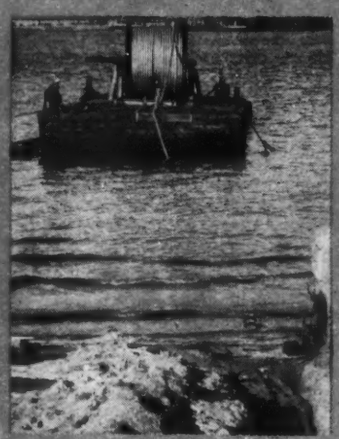
4000-foot Okonite non-leaded submarine cable provides another high voltage power link between San Diego and Coronado

Anticipating the need for more electrical power to keep the fast growing Coronado area humming, San Diego Gas and Electric Co. recently laid another Okonite high voltage submarine cable across the bay to Coronado.

This 50-ton, 4000-foot cable was shipped across the continent by rail and rewound to a special reel aboard a barge upon arrival. The laying operation was completed in the record time of 10½ minutes.

Constructed by The Okonite Company, this 12,000 volt cable has an overall dimension of approximately 4¾ inches and carries three 500,000 cm conductors and three pairs of 12 Awg communication wires. The Okolite insulated conductors are resistant to moisture, heat, ozone, chemicals, acids and alkalies . . . thus eliminating the need for lead sheathing . . . an important saving in weight and cost. A tough outer steel armor, helically wound over a cushion of pre-saturated jute, provides plenty of protection against possible mechanical damage to the cable.

When confronted with the problem of crossing rivers or bays . . . or when selecting the right insulated wire or cable for any requirement . . . let Okonite Engineers give you the benefit of their experience. The Okonite Company, Passaic, New Jersey.



NEARLY 400 FEET PER MINUTE was the speed this 50-ton Okonite Submarine Cable reeled out to the floor of the bay.

OKONITE OKONITE SINCE 1878 **insulated wires and cables**

4574

Electrical World

JUNE 8, 1946

Objectives

As has been our custom for several decades to present a reasonably complete report of the annual convention of the trade association of the electric utility industry in the first issue after the sessions, we devote a major part of this issue to abstracts of the papers given earlier this week at the Edison Electric Institute annual meeting. Individually, the papers were splendid and, as was to be expected in the first convention after the war lapse, a great variety of subjects was discussed.

Sometime, however, we hope to be able to report a convention that has a central theme that can set an objective for thought and action during the next year or years. While bodies like the E.E.I. cannot commit their members, they can be a guide and stimulus to fameness of effort.

Objectives have a stimulating effect upon the people of an industry and, because they require the maximum of cooperative effort to achieve the aims sought, build up within the entire electric industry a feeling of interdependence and comradeship.

A decade and a half ago the American people turned to government for leadership because industry had no objectives that offered hope of a better life. In that time, however, the American people have learned that the price of objectives set by government is high and the benefits not always real. Nevertheless, the American people will again turn to government if industry does not have big objectives and the will to achieve them.

Specifically, our worst fear is inflation. Economists are agreed it can be met by productivity of labor which will make enough at costs low enough to absorb purchasing power. Producers of goods everywhere are looking to electricity to solve their problem of production. Individual utilities, manufacturers and others are doing this work, but there is no unified industry effort. The American people have not been told that the electrical industry is on the job with an objective to prevent runaway inflation and to make the gains in workers' wages real gains.

People of America are apprehensive of Russia's aims and they should be, if for no other reason than the fact that the Soviets are now starting a five-year program to double the electricity supply and so increase the power behind each worker. Our whole national defense hinges on our ability to outproduce any other nation. In time of war with our limited manpower there is just one way to maintain our productive superiority and that is by keeping ahead in the amount of electric power behind each worker—power that is never too little or too late. Who is going to do this job—the electrical industry or government? What an objective to sell the American people!

These and other objectives, which could be named, require teamwork on the part of all branches of the electrical industry. Every one carries big public benefits. For none of them, however, will the industry get any credit unless the public knows there is an objective and is told regularly of its progress.

Trade associations more than pay their way in their services to members such as standards, statistics, information interchange, practices, and reports, but here is a major opportunity to serve America as well—inspired leadership through big objectives.

The PRESIDENT Reports

DURING the five war years over a trillion kilowatt-hours of electric energy were generated in this country (83 percent of it by the electric companies and 12 percent by the federal government). At no time was any part of the war program delayed or hindered by lack of electric power, while, at the same time, full service was maintained to all customers, military and civilian. All further discussion of a "power shortage" has ceased. Nor was this the only contribution of our industry. We have computed that the amount received by the electric companies for power sold by them, for war purposes only, was $2,350,000,000. These same companies during the same period paid almost the same amount, or $2,194,000,000, to the federal government in direct taxes.

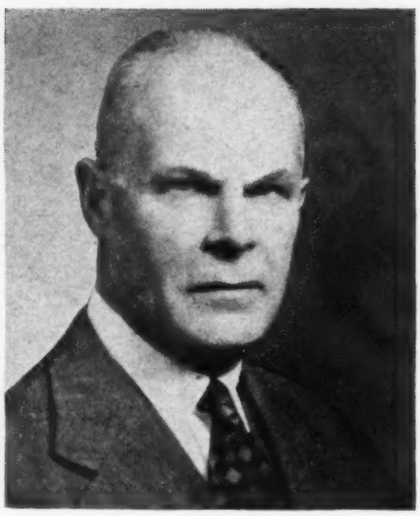
It is well known that all things entering into public utility operation cost more at the end of the war than when it began. The hourly pay in the electric utility industry rose about 30 percent during these years. Unit fuel cost advanced 32 percent, and taxes, on a comparable basis, 24 percent. In sharp contrast to this, the average unit price of residence electricity declined by 11 percent from 1940 to 1945; of commercial electricity it declined by 10 percent, and of industrial power by 12 percent.

Electric energy output for a consecutive twelve-month period reached a peak in the month before V-J Day of 229,300,000,000 kilowatt-hours. Since that time, its decline of only 8.7 percent on a twelve-month basis seems remarkably small, in view of the drastic cancellation of orders for war supplies which began last summer. Industrial power declined, of course, more than this, but that decline was largely offset by substantial gains in residential and rural consumption and a slight gain in commercial use.

In spite of constant difficulty throughout 1945 in obtaining labor and materials for construction, nearly a million more electric customers (over a quarter of them farm customers) were added during the year, bringing the total at December 31 to 34,000,000. There was also an almost complete stoppage of the manufacture of electric appliances during the year, in spite of which average annual household consumption has now reached a new high of 1,275 kilowatt-hours,—a gain of nearly 11 percent in 18 months.

Financially, the business-managed electric utilities in 1945 passed the three billion dollar mark in gross revenues, a gain of $864,000,000 since 1939. This entire gain was taken up by greater expenses and taxes, the gross corporate income having decreased about 1 percent. It shows at least that all possible increase in net earnings arising from war operations was completely diverted into the U. S. Treasury, which should fully dispose of any claim, if such there be, that the electric utilities had profiteered during the period of the war emergency.

For the twelve months ending June, 1946, (partly estimated) the net corporate income shows a gain over 1945 of about $55,000,000. This is partly accounted for by the elimination, since January 1 this year, of the excess profits tax. Lest this should appear to be a reason for general rate reduction at this time, it should be borne in mind that increases in wages and fuel costs are likely to amount to about $100,000,000 in the twelve months now beginning.



Affiliated Photo—Conway

CHARLES W. KELLOGG

Became associated with Stone & Webster interests in 1903. Elected president of Engineers Public Service Co. in 1925 and board chairman in 1934. In June, 1936, he was elected president of the Edison Electric Institute and in June, 1939, he resigned as chairman of Engineers Public Service Co. to become the first paid president of E.E.I. Served as chief consultant on electric power in the Office of Production Management before that agency was superseded by the War Production Board

Commercial Activities

We have the duty, as an essential part of our paramount service function, to do everything in our power, not only to render the best service practicable, but also to bring to the public, as widely as possible, information as to the many ways in which electricity can be of greater use, convenience and economy in the home, shop and factory and on the farm. Happily, this duty coincides with our own best interests, in that greater use makes for lower unit costs and hence more contented customers and more stable business. In fact, with relative maturity attained in the matter of manufacturing economy and with the present increasing costs of labor and materials (which, as stated, bid fair to eat up all the savings from reduced federal taxes), our only hope, in keeping unit costs down to present levels, rests on the ability to market more of our product.

*Abstract of report to 1946 annual meeting of the Edison Electric Institute.

C. W. KELLOGG, *President, Edison Electric Institute**

This duty rests squarely on our commercial forces and I am glad to be able to report that they are fully alive to their responsibilities. This spring's sales conference in Chicago brought out the largest attendance in the Institute's history. Our Commercial Committee has brought out recently, at a cost of $135,000, a comprehensive sales training course, which has appealed very favorably to our member companies—so much so that its entire cost seems likely to be recouped from the sale of the material.

Rural Electrification

The utilities began pushing their lines out onto the farms 40 years ago; and by the end of 1935 they were serving about 789,000 of them. From the start, the long extent of line per customer proved an economic drawback to complete farm coverage. In 1935, in recognition of this economic difficulty and believing that government credit could properly be extended to bring electricity to those farms which, without this help, could not then get it, Congress passed the REA act. During the ten years ending 1945, the REA cooperatives had connected 1,050,000 farms; but during the same period the electric companies and others had added 1,181,000, so that at the end of last year, of the total of 3,020,000 farms then connected, only about one-third were on REA lines.

These electrified farms represent about 50 percent of the total farms in the country. But this figure reflects most inadequately the true accomplishment in farm electrification, in the following particulars: There are about 1,000,000 farms already reached by existing lines but not taking power; there are about 300,000 farms so remote as to be beyond all practical reach at any time; there are about 200,000 farms which are either without buildings or with their buildings not occupied. After making all these adjustments, which add up to about 1,500,000 farms, the number of farms remaining to which lines could be built drops to about 1,500,000, or only 25 percent of the total farms. Present plans by both the utilities and the REA are to reach most of this balance within three years.

Service Standards

The constant effort of our industry from its earliest days has been to improve the dependability of our service. With respect to our large generating stations, especially as supported by interconnection, this goal has been attained; and with respect to major transmission lines, fast operating breakers on the one hand and multiple interconnection on the other have measurably solved our problem. Both of these have to do with the supply of bulk energy; they still leave not completely solved the problems of maintaining service at the point where the customer uses it; for it is small consolation to the town customer, without lights, heat or refrigeration, or the farmer, without water or incubator heat or with unmilked cows, to know that the power plant and main lines are operating smoothly far away.

Government Competition

We have now become thoroughly familiar with the entry of the federal government into the electric power business. In 1935 only 1 1/3 percent of the electric energy generated for sale in this country was manufactured in federal plants; in 1945 they manufactured 14 percent. This difference is made particularly striking by comparison with municipal electric plants, which manufactured about the same percent of the total energy (4.3 percent) in both years.

The difference between the two (federal and municipal) in development during the decade just ended is the difference in basic set-up. While each enjoys tax exemption, the municipal plants have to raise their own capital and pay the charges on it, while the money for the federal plants comes from a supposedly bottomless federal treasury, without obligation to pay charges on the capital. With the municipal plant, the loss in local taxes and the charges on capital are plainly visible; but with the federal plant, the burden is so widely diffused and so mixed in with other government operations as to be hidden from the average citizens, large though the total has now become.

Present-Day Problems

Our present struggle is with what Owen Young described, 24 years ago, as "the danger that the growth of our industry will outrun public understanding; that people will see and fear our size without understanding our service." Since our industry output today is over four times what it was when Mr. Young made that penetrating statement, it is clear that this danger is greater today than ever before. This danger is now being tackled on two main fronts. The first of these, begun five years ago, is the advertising and radio campaign being carried on by the 170 electric light and power companies comprising the advertising group, under the expert advice of N. W. Ayer & Son. The second is the work inaugurated about a year ago by the National Association of Electric Companies, 107 in number, under the capable leadership of Purcell L. Smith, in arranging for operating company officials to advise the Congress, through its committees, of the facts surrounding such proposed legislation as directly affects such companies. To both of these activities the Institute has made available its great store of factual information—thus both enlarging the scope of its effectiveness and avoiding duplication of expense, while at the same time maintaining the disinterestedness so essential for the production of dependable data.

INTENSIVE SELLING
Is A Must

G. W. OUSLER, *Duquesne Light Co.**

GOOD MANAGEMENT has produced results by concentrating on two major factors: (1) Increasing operating efficiencies and providing more economical operating methods; (2) Increasing the volume of sales. During the past number of years we have been able to produce and distribute electricity at lower and lower unit costs, and at the same time provide better and better service. Through active sales promotion we have been able to increase our volume tremendously, improve our load factors, thus lowering fixed charges per unit of output.

The Job Ahead

But what of the future?

Certainly our obligations to our customers, employees and owners will not change. However, it seems to me that we are not in as flexible a position to carry out these obligations as was the case in the past. Wages have risen and are still rising. Material costs have increased tremendously. Taxes are high. While there is still some improvement possible for greater operating efficiencies and improved operating conditions, unless some radical development appears on the horizon, the margin left for reducing costs in this manner is probably getting pretty thin.

Therefore, to continue to carry out these responsibilities, we will have to depend more and more on increasing our output by adding to our lines a greater volume of profitable business. This will take intensive sales effort, because very little business comes automatically to any industry, and the public utility industry is no exception. There may be a few who believe that low rates and good service alone will attract business. My experience indicates that this philosophy is unsound.

G. W. OUSLER

George W. Ousler entered the service of the Philadelphia Co., Pittsburgh, in 1916 immediately following graduation from the Massachusetts Institute of Technology. In 1927 he was made director of sales engineering, in 1929 manager of rates and retail service, and in 1931 general sales manager. He was elected vice-president in charge of sales in 1942

Every industry in this country, automobile, home building, furniture, clothing, etc., is going to make a determined effort to get as big a share of the customer's dollar as possible through intensive sales effort and broad advertising programs. If we in the electrical industry are to get our proper share, our sales efforts will have to be equally intensive. Manufacturing of items will not be difficult—distributing and selling these goods will be the major job. Needs do not make sales. Selling must convert needs into purchases.

Our goal in the residential market is the all-electric home with the electric range and the electric water heater as the major contribution. These two appliances are still in the infant stage in national saturation. There are applications for air conditioning, air cleaners, attic ventilating fans, electric blankets and many more appliances, with possibilities of increased lighting load which are still very broad.

Opportunity in Lighting

The commercial market also has possibilities of expansion, but, at the same time, has some problems to overcome. In many instances they are more severe than in the residential market. Fluorescent lighting is a good example. It offers many opportunities for increased level of illumination and good distribution of light, but it will require plenty of sound selling to achieve results.

During the war many techniques, methods and devices were developed which will make it possible for even broader applications of electric service to our industrial customers. However, there will be needed in this field well trained men who will be able to prove to our industrial customers benefits which will be derived from the use of these applications. We are going to face some severe competition.

The problem of extending lines in the rural areas has been pretty well solved and the major activity that is before us is the utilization on the farm. Our rural representatives will have to be entirely familiar with the farmers' problems.

The load exists and we can get it if we have the will to go after it. But well-trained personnel and intensive sales effort are a necessity if we are to get it. Our load will not grow automatically, because every industry will bid for as great a share of the customer's dollar as possible. Needs do not make sales. Selling must convert needs into purchases.

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

SERVICING ELECTRICAL APPLIANCES

R. L. WHITE, President, National Electrical Manufacturers Association*

THIS PROBLEM of servicing appliances is an embarrassing one. It is primarily the problem of the manufacturer —yet other people—utilities for example—have to help us take care of our children. Service is our problem as manufacturers because fundamentally we get the most benefit from good service—and suffer greater loss of good will when it is not available. Good service is a good-will builder. It's a potent sales weapon for the established brand name manufacturers. Good service means repeat sales, means sales of other products in our line. We may spend millions of dollars on product advertising—only to lose much of the good will by poor servicing. It may be true that others get criticized for service failures, but in the final analysis most of the blame falls on the maker of the merchandise.

Service is as much a factor in a successful retail business as it is for the manufacturer and this goes for utilities that merchandise. Sales, particularly of major appliances, are often made because the consumer has confidence that there will be service and if I were a dealer, I would be very much interested in giving good service as a good-will builder and to encourage repeat sales. Naturally I would expect my service department to be self-supporting, but I would use it as a sales rather than a profit builder.

I am not here this morning to propose that utilities should extend their service facilities, but I do suggest that you cannot dismiss the problem by simply stating that it belongs to the manufacturer.

From our point of view, if the utility wishes to give service, it has many advantages. Many business offices adequately cover the territory, whether urban or rural. Utilities are engineering minded with a technically trained staff —able to tackle such problems—and by and large the utility has the reputation for being reasonable in its charges.

RICHARD L. WHITE

Obtained his early experience in electrical manufacturing field with Western Electric Co. In 1923 joined Landers, Frary & Clark. He was made assistant treasurer in 1927, treasurer in 1928. He became president of the company in 1941. In 1945 was elected president of the National Electrical Manufacturers Association

Having admitted that the manufacturer gets the most benefit from good service, what should he do to see that this service is given? In the first place he should see that there are adequate stocks of parts available at fair prices—complete stocks at the factory and stocks of the most important repair parts in strategic locations around the country.

Secondly, he can take steps to provide service promptly by making prompt shipment of spare parts where needed. A great many appliances, particularly the small ones, come back to the factory for repair anyhow, and prompt service is a great factor in good will.

Another responsibility of the manufacturer is to provide adequate service manuals including lists of repair parts and price lists and to see that the utilities and the dealers have this information.

How can the utility that does not wish to undertake service itself help out in this problem? First of all you can operate service training programs. You can teach the dealer how to give proper service. You can train young men who wish to be repair men and help them get jobs with the local dealers. Right now I think you could build a lot of good will for yourselves by setting up such a training program for G.I.'s, helping them to become service men and helping your own public relations.

Another way you can help us is to act as a watchdog, distasteful as this may be. The manufacturer is not in contact with the consumer—we do not know where our service stations or our dealers are giving poor service or making overcharges which damage our reputation.

One more way in which the utility can help: many of the service difficulties result from improper use of appliances. The utility home service organization can be of great assistance by helping the consumer to use his electrical equipment properly.

You see, you really can help us in this problem even though you get out of actual servicing yourself, and you are not doing it just to be helpful to us. Much of your own livelihood depends upon the satisfaction that electrical appliances give the consumer. We must encourage their use and the extension of their use.

---

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

ATOMIC ENERGY For

A Utility Man Looks at Atomic Energy

JOHN C. PARKER, *Consolidated Edison Co. of New York Inc.**

JOHN C. PARKER

Served eight years in the teaching profession, and twelve years were devoted to engineering and executive service with Ontario Power Co., Niagara, Lockport & Ontario Power Co. and Rochester Railway & Light Co. prior to 1922. In that year he joined Brooklyn Edison Co., serving as electrical engineer, vice-president and for four years as president before joining Consolidated Edison as vice-president in 1936

ANY present discussion of the power possibilities of atomic energy is bound either to be hypothetical or, if conclusive in its statements, to be well in advance of the facts and probably wrong. None-the-less the interest, spontaneously generated and fomented by popular discussion, compels some kind of speculative preview.

While there are strong indications that great peace-time results will flow from the development of a new technique, it will be desirable to begin by an attempt to eliminate some of the exaggeration from the picture.

The first of these exaggerations is in the picture set up that atomic energy will supply the needs of a hitherto power-starved world. The difficulty is not in the representation that vast amounts of energy are available from nuclear processes but rather in the implication that heretofore there have been serious physical limitations of the amount of power available for the needs of society.

Energy Starvation Not Imminent

Conventional fuels exist or can be made available from known resources in most parts of the world. Where the economy of an area has, with sufficient economic incentive, called for the use of energy, all that has been necessary has been to dig or to drill for fuel, to import fuel or to dam streams and to build power plants.

So far as concerns this country, the proven coal reserves are estimated to be adequate to the present power demands for the next fifteen centuries. Here, at all events, energy starvation is not imminent. Whatever may be said as to the physical difficulties of transporting solid and liquid fuels into some areas, in the main any barrier that exists is primarily an economic one largely resulting from a thin general economy stemming from causes quite different from energy unavailability.

A second exaggeration in the somewhat emotional broadcasting that has taken place has its origin in a too facile reasoning from analogue. It has been said that as Watts' improvement of the steam engine ushered in the industrial revolution, so the atomic revolution is going, through power processes and almost solely through power development, to bring about a second great industrial revolution.

Without for one minute attempting adversely to prejudge the contributions that atomic energy can make in this direction it might be well to bring into its proper perspective the contribution that the power arts have made to the industrial development of the past century and a half. Clearly without mechanical power the machine age could not have come into existence. It is sometimes forgotten, however, that the machine itself had at least an equal indispensability in our present type of industrial development.

The problem here obviously becomes an economic one. If exceedingly low cost energy can be produced by any new process, certain forms of utilization will be more fully warranted economically. In those industries, however, in which the cost of power represents only a few percent of the total cost of production it is evident that no new process of energy production, were it to be entirely without cost for the energy, significantly could affect economic expansion.

If we are right that our analysis in the main must be made in economic terms, we might go a little further and inquire as to where the economies of atomic energy production will be found. Nothing that has been said to date indicates that we may look for systems of transmission and distribution arising from atomic power plants, as such, different from what we have today.

At the powerhouses there is no hint that atomic energy will change the so-called electrical galleries or the switchyards. Indeed there are even some possibilities of atomic energy development that may utilize the present turbo-generators. No serious suggestion in any event has been made that we shall be able to dispense with generators and turbines of sorts though we may, under some of the atomic possibilities, replace present ones with others presumably representing substantially the same capital costs.

The economies that may take place

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

Public Service

back of the turbo-generator are the principal hope of economic betterment by the development of atomic energy. These economies may be of great significance within the boiler room while at the same time it is too much to expect that they will radically modify the over-all industrial structure of society. They may, of course, be significantly worth pursuing.

What economic advantages may ultimately be found to accrue from the use of atomic energy for power purposes evidently then will come into systems distributing energy rather than into the lesser isolated plants, and, granted development within the compass of the free enterprise system, should serve to strengthen rather than to weaken the position of our electric utility undertakings.

Two difficulties at present, and for perfectly understandable reasons, retard the initial collaborative effort of the industry.

The destructive possibilities of fissionable materials are so frightful that the release of information on which to base developmental speculation has been closely restricted. There can be no criticism of such restriction if it is essential to national security or to the preservation of international order. There may be question, however, whether part of the restriction doesn't go beyond the necessities in the case, and indeed whether it is not almost inevitably futile.

The second impediment to industry collaboration in the development of power from nuclear sources lies in the tacit assumption that necessarily permission to use or, within a rather vague definition, to produce fissionable materials must be highly restricted.

Here we must not be blind to the realities. It is frankly recognized that the possession by individuals of relatively small quantities of segregated explosible materials would constitute a menace to domestic order and to international security. It does not necessarily follow from this, however, that all power development from atomic sources must be by a central authority.

It is suggested that resourcefulness addressed to the minimizing of centralization and control rather than to a highly elaborated centralized control might secure the blessings of safety while at the same time retaining the advantages of widely disseminated initiative in this great development.

• • •

HARRY A. WINNE

Joined General Electric as a student engineer in the testing department in 1910. Subsequently served in the testing, power and mining engineering and then the industrial engineering departments. In 1937 he was made assistant to the vice-president in charge of general engineering operations and is now vice-president in charge of engineering policy for the entire company

Engineering and Political Aspects of Atomic Energy

H. A. WINNE, *General Electric Co.**

EFFECTIVE utilization of atomic energy for industrial purposes involves first the engineering problem of devising heat or thermodynamic systems and engines to transform instantly released heat into mechanical or electrical power. In many respects this, of course, is a familiar problem. One may expect the use of many well known devices, such as heat exchangers, turbines, and heat transfer fluids, for conveying heat from one mechanism to another. However, conditions associated with the nuclear reaction introduce new factors which place certain definite limitations on the system and its components.

An important requirement affecting the choice of heat system is the necessity of shielding power plant personnel and equipment from all neutron and gamma ray radiation. Such shields may be 5 ft. or more in thickness, including a considerable amount of heavy material such as iron or lead.

There are a large number of variations which one can conceive for the transfer system. Most of the systems proposed use a heat transfer fluid to transform heat into power at the blades of a turbine. There are other heat engines besides the turbine which might be practical on some special application, but it seems likely that vapor or gas turbines will be used in the first installation.

A new invention might open the possibility of changing heat energy directly into electrical energy. Although no practical solution of this type exists now, one should never

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

artificially limit the horizon in the search for such an attractive objective.

It is obviously impossible to make an accurate analysis of the economics of atomic fuel on the basis of information generally available today. The atomic energy released, if a pound of fissionable material is completely consumed, is about equivalent to that from the combustion of 1,500 tons of coal. On this basis, if we assume efficiency of use, fixed charges and other items are equal for both fuels, then the fuel cost for coal at $4 per ton is about the same as for fissionable material at $6,000 per pound. It is only surmise, but it would seem as though this latter figure should be reached or bettered in the course of lengthy research and development.

Because of the unprecedented importance of atomic weapons, we may expect a certain amount of national control in the field.

The national situation is at present pretty largely in control of the Army's Manhattan Engineer District, because Congress has not yet adopted legislation to bring it under civilian jurisdiction. May I state here parenthetically that I feel the Manhattan District has been subjected to a great deal of unjust criticism. It has had no alternative but to consider the whole project primarily from the military and national security viewpoint, unless and until our government adopts a different policy.

The report of the Committee which prepared the so-called "McMahon Bill" states that one reason for rigid licensing control is "that the sudden introduction of certain devices utilizing the power released by nuclear fission might precipitate profound economic disorganization." It seems to me this fear is much more imaginary than real, because the development and widespread use of any new source of power is going to take a long time and occur very gradually.

• • •

Basic Factors of Atomic Energy Utilization

K. H. KINGDON, *General Electric Co.**

IT has been established that the energy liberated in a nuclear reaction is connected with a disappearance of mass, and that, in fact, this loss of mass is an exact measure of the energy liberated in the reaction. This is the famous principle of the equivalence of mass and energy derived on theoretical grounds by Einstein just 40 years ago. According to the quantitative formulation of this principle, the disappearance of one pound of mass in any nuclear reaction will be accompanied by the generation of 11.4 billion kw.-hr. of energy. We may appreciate the enormous scale of this conversion factor by recalling that electrical power consumption in the entire United States was about 220 billion kw.-hr. in 1944.

The kind of structure which has been developed to release nuclear energy, by means of the phenomenon of uranium fission, is called a pile. It has two main components, the active fissioning material (uranium), and the moderator. These are surrounded by a neutron reflector and a protective shield. Control rods of some materials like boron are provided to regulate the chain reaction, and a heat exchange fluid to remove heat. The moderator is made of some element like carbon or beryllium which does not capture neutrons readily, but whose atoms are quite light so that when a fast neutron collides with one of these atoms some of the momentum of the neutron is transferred to the atom and the neutron is slowed down.

Uranium is arranged in a space-lattice of rods set in holes in the moderator structure. When an atom of U235 undergoes fission in one of the rods it emits fast neutrons, which have a good probability of escaping from this rod without much loss of speed, and without producing nuclear reactions in the rod. These neutrons then enter the moderator, and are slowed down by collisions with the atoms of the moderator until they are of sufficiently low speed to be captured by uranium nuclei. The slowed neutrons may then enter another uranium rod and produce the desired nuclear reactions and resultant heat there.

It is desirable to transfer the heat at as high a temperature as possible in order to obtain efficient utilization in a heat engine. Therefore, the active rods should be operated at as high a temperature as is consistent with their mechanical and chemical stability. Operation at sufficiently high temperature is one of the chief problems which must be solved in developing a power pile. Nuclear properties are of prime importance in selecting materials for use in a power pile, but mechanical and chemical stability at high temperatures are also of great importance.

To those of us who are accustomed to thinking of conventional radiation phenomena as presented by x-ray tubes, radium, and ordinary nuclear experimentation, the pile presents radioactive radiations on an almost inconceivably

KENNETH H. KINGDON

Has engaged in research work for the General Electric Co. at Schenectady since 1920. Present title, research physicist. Inventor of various electronic devices. Mr. Kingdon was born in Jamaica, B.W.I., and received his B.A. degree at McMaster University, Toronto, and his M.A. and Ph. D. degrees at the University of Toronto. He spent two years, 1917-19, in research work at the British Admiralty before joining G. E.

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

large scale. These radiations from the pile are so intense that human exposure to their direct effects for even a small fraction of a second would be fatal. Accordingly the pile must be surrounded by an absorbing shield several feet thick to protect personnel from the neutron and gamma radiations.

It should be pointed out that the amount of radiation escaping through the shield decreases exponentially as the thickness of the shield is increased. Hence a doubling of the power of the pile, and, therefore, a doubling of the amount of radiation incident on the inside of the pile, would not by any means require a doubling of the thickness of the shield.

Certain fission products are accumulating whenever the pile is producing power, and eventually would poison the pile enough to stop the chain reaction. It will be necessary, therefore, to remove the active material periodically from the pile and extract the poisons. It is thought that the pile can be designed so that this need only be done at long intervals, thus making economical and practical operation of the pile possible.

• • •

Nuclear Research Related To Electric Power Generation

DR. C. G. SUITS, *General Electric Co.**

DR. C. G. SUITS

Became a member of the General Electric laboratory staff in 1930. Was made assistant to director of G. E. research laboratory in 1940. Elected a vice-president of the company in 1944 in charge of the company's research laboratory. Widely known for his research in high temperature arcs. During the war devoted the major portion of his time to the Office of Scientific Research and Development

RELEASE of nuclear energy on a large scale has brought about a complete reexamination of the problems of power production in the light of the new possibilities thus presented. This study has not shown in any final form what the atomic power plant of the future will be, but it has made it possible to sketch in some of the outlines of the picture. Most important, however, it has led to a realization of the scope of the problems of atomic power plant development, placed a tentative time scale on the project, and has consequently indicated the scale of the research and engineering effort required for the job.

It has seemed inevitable to us that the electrical manufacturing companies, with their long experience and impressive technology in power production, would take a leading part in the atomic power problem, and in the national interest could indeed do no less. Planning has therefore gone forward with that objective in mind. This problem, more than any other single factor, has had an important influence on the planning of research in the General Electric Co.

A careful assessment of this task has shown that the development of economical atomic power will not come about as a simple by-product of the atomic bomb. A tremendous amount of knowledge gained from the bomb project will have application to the problem of atomic power production, but a great deal of research must be done to arrive at an answer which will be of practical interest to the electrical power industry and other users of prime movers.

A long-range program of nuclear research has been laid out with two main lines of attack, (A) an exploration of new types of nuclear reactions, especially with recently developed electron accelerators, and (B) an investigation of nuclear fission for its power production possibilities. At present (A) is an active program, while the projects under (B) are not yet implemented by necessary experimental equipment and facilities.

Although a good deal of nuclear information, as yet not declassified, has accumulated as a result of atomic bomb work, it is certain that much more will be required before practical, and especially before economical, piles will be built. The nature of this problem is, in some respects, similar to that of the development of other new types of prime movers; for example, the mercury boiler-turbine system.

A realistic point of view of power pile development must recognize the fact that much detailed knowledge analogous to the solubility of iron and mercury must be obtained about materials of construction of piles. These materials operate in an intense neutron "atmosphere" and there is very little information on the life and properties of materials under these conditions. Methods of testing must be developed and a body of information must accumulate as the work progresses.

Research and development scientists and engineers who are privileged to work on this problem have a fascinating opportunity which seldom has been matched in the history of technical developments. Their great enthusiasm for the work and their confidence in its ultimate usefulness to mankind are sufficient reasons for optimism concerning the final success of atomic power plant development in practical and economical terms.

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

PLANNING DISTRIBUTION for

. . . *Facilities Required*

FRANK SANFORD, *Electrical World**

OPPORTUNITIES for broad viewpoints in distribution policy planning that have seldom been equaled in scope are offered by present plans for increasing customer loads. Load-building programs of the next few years will necessitate parallel distribution-building programs, with residential and commercial services moving to a primary position from their secondary place during the war.

A considerable portion of the expected load increases will be at the lower end of the rate scale and it is important that distribution costs conform. This problem for the distribution engineer may be stated as that of carrying more load on the distribution system without a proportionate increase in the investment.

Determining Factors

Continuation in the downward trend of unit investment cost may depend to a large extent on the balance of several apparently unrelated factors.

(1) Most important on one side of the account is the load density increase in the period since many present practices in rating and arrangement were started.

(2) Second is a better understanding of thermal capacity and emergency ratings. Loading to the maximum economic value is parallel to load factor improvement in seeking to make full use of the facilities available.

(3) On the other side of the account is today's increased cost of construction. Maintenance and operation costs are also higher, and present comparisons with the cost of money may justify even greater investments.

(4) Higher line costs can be balanced by a longer life expectancy on the side of physical depreciation with the pole and hardware protective treatments now available.

FRANK E. SANFORD

Starting with Cincinnati Gas & Electric Co. as cooperative student, Mr. Sanford served as engineer on layout of industrial substations, transmission engineer, distribution engineer and as superintendent of distribution engineering. Mr. Sanford joined the editorial staff of ELECTRICAL WORLD in the Chicago office in March. He was chairman of the E.E.I. transmission and distribution committee in 1943-45

(5) There is relatively little spread between the complete costs of a distribution feeder for minimum loads and a line of similar construction for several times the minimum value of load.

The most direct answer to the problem may be its restatement in reverse—distribution facilities must have more load to carry to avoid an increase in the investment per customer. They must be planned for longer use, allowing for more load growth with less change and with less day-by-day cost. With fair assurance of continued growth through a period of several years, and with past experience as a guide, both the new additions and the rearrangement of older facilities can be developed along lines of permanence not always possible under the conditions of earlier years.

Normal ratings of feeders have been increased from 150 and 200 amp. to 250 and 300 amp. Doubling these values to 500 and 600 amp. may be in order, with two trunk sections out to separated load centers.

Emergency capacity reserves in feeder ratings are an important part of the investment in distribution. The reduction in frequency of outage, an increase in the number of feeders that may be tied together and higher emergency ratings based on thermal capacity all combine to decrease the margin of capacity needed on each feeder. As much as 20 or 25 percent of the feeder capacity may thus be released for normal load growth.

Heavier Loads on Existing Lines

In the past two years there has been an acceleration of interest in aerial cable construction to improve reliability and appearance. Cable will increase line costs still further and add emphasis to the importance of advance planning because it is less flexible than open wire for rearrangement and replacement.

Present distribution facilities can carry much heavier customer loads without any important increase in distribution investment, by increment growth and some changes step-by-step with the load. For the long pull, the trend can be continued only if the new load conditions are recognized in advance. Major substation plans, subtransmission and inside wiring must all be included in the view for economic growth of distribution.

---

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

INCREASED LOADS

. . . Related to Commercial Policies

J. H. FOOTE, *Commonwealth & Southern Corp.**

ALLOCATION of voltage drop allowances to the component parts of the distribution system presents to the distribution engineer his greatest challenge and his greatest opportunity in order that a fine economic balance be attained. He must dole out frugally but with knowing confidence the few volts at his disposal to the service, to the secondary main, to the transformer, and to the primary main. The allowable variations in these allocations throughout the daily cycle of shifting load demands must be charted. Sudden variations produced by short-time demands must be taken into account.

For instance, the studies of the joint committee on motor starting currents developed the significant observation that a transformer-secondary system adequate to handle the voltage flicker produced by single-phase equipment having the recommended starting current characteristics would also be adequate from a voltage drop standpoint to serve a range saturation of 40 percent on the same secondary system if suitable augmentation of transformer and primary capacity were provided.

Too much attention cannot be paid by commercial and distribution engineering executives to the problem of voltage flicker produced by customers' equipment and the solution of this problem by preventive measures wherever possible.

Coordination of Planning

Another subject of concern relates to the domestic water heater which will undoubtedly form one of the most substantial components of increased residential loads in the years to come. A positive and constructive long-range plan for serving this type of equipment is required on many systems. It is felt that means are available for serving water heaters of proper design economically, and the problem largely develops into one of coordinating commercial and merchandising policy with rate structure and distribution economics.

JAMES H. FOOTE

An outstanding authority on design and operation of electric power systems, Mr. Foote has been a practicing engineer in the State of Michigan for more than a quarter century. At present he is supervising engineer of Commonwealth & Southern Corp.

And that directs attention to the necessity for management-wide coordination of planning for the increased loads we all expect. Departmentalization is a device increasingly necessary the larger the organization. Most electricity supply operations are thoroughly departmentalized with responsible heads usually coordinated at the executive level. The responsibilities of each department head relate primarily to the successful performance of his particular organization.

Thus the merchandise manager may be given the responsibility for seeing that a certain volume of cooking devices or of domestic water heaters are placed upon the system. That's his job and he will naturally go at it in the way that achieves the goal most readily. In the achievement of this goal he may sell a device on which the customer saves $10 but which may require the investment of $15 in the company's plant in order that it may be served satisfactorily. At the same time the rate department may have assumed that the cost to serve this particular load is incremental in character so that nothing has been provided in the rate for the additional plant necessitated by the characteristics of the device. All this may add up to a net loss from the standpoint of the over-all operations of the company.

Must Get Together

This does not constitute the pointing of the "guilty finger," at any one in particular. It merely means that in the interest of the entire operations of the company there should be effective coordination among distribution engineers, system planning engineers, commercial executives, those responsible for the merchandising, and those establishing rates in order that all of these considerations may be based on the same set of costs and considerations.

Increased customer loads of tomorrow will involve the sale of large amounts of current at a very low price. It will be necessary that the skill and coordination of the entire organization be directed toward the serving of these increased loads in the most economical manner possible in order that customers may continue to enjoy the remarkably low cost of a service whose quality will continue to improve as customer requirements rise.

* *Abstract from paper at 1946 annual meeting of the Edison Electric Institute.*

TELEPHONE SERVICE on Rural Lines

A. E. SILVER, Ebasco Services, Inc.*

PROBLEMS of joint occupancy of open-wire power and telephone circuits in long-span farm-type construction have been mutually discussed from time to time for more than a decade. However, it is only quite recently that Bell System engineers have considered they had at hand a type of wire and other devices essential to safe and successful coordination. The first trial of such construction came to fruition in 1945 through the initiative of Commonwealth & Southern Corp. and Southern Bell Telephone Co. This followed a survey of low customer density areas, seeking ways of extending both services to more people. These two companies selected for this trial an existing 16-mile farm power line of Alabama Power Co., near Selma, Ala.

At the present time, two trial installations of carrier telephone are in use—one at Selma, Ala., on the lines of Alabama Power Co., and the other at Jonesboro, Ark., on the lines of Craighead Electric Cooperative.

Engineering Aspects—Looking Ahead

The farming public will soon require power and telephone service coverage to a high degree of saturation. Accomplishment calls for supply methods planned to yield maximum over-all economy—in other words, methods directed to the best engineering solution. Already field demonstrations have shown the technical practicability of rendering power and telephone service in the farm areas by joint facilities of either the open-wire or the carrier type, or very likely, by combination of the two.

The present very active farm power extension programs are bringing steadily decreasing opportunity for telephone participation in design coordinated in advance of facilities being built in presently unserved territory. Modifications after initial construction, of course, reduce savings.

A still larger number of prospective telephone subscribers, it is believed, can be reached over existing rural power lines extending into areas not at present receiving telephone service. Especially for the carrier telephone project, with the equipment scheduled to be available in very substantial quantities within the next few months, it is clearly evident that now is the time actively to take advantage of whatever the application holds in store practically.

Because of Bell Telephone prominence in the industry, it sometimes may be overlooked that approximately half the present rural telephones in this country are supplied by the independent companies and cooperatives. While, doubtless, Bell System will continue the initiative in furthering facilities for jointly suplying rural power and telephone service, these other groups constitute a substantial part of the potentialities from the power-industry angle. With carrier telephone equipment developments available to these groups, as announced by the Bell System, it would seem that independents' participation should be expected and encouraged.

The present stage is that of perfecting technical details and developing the facts for sound appraisal of economies and other benefits. The Edison Electric Institute-Bell System active joint studies are directed to this objective, through the development of knowledge and guides for:

1. Providing both services at minimum investment.
2. Efficient operating procedures and practices.
3. Sharing benefits accomplished.
4. Contractual arrangements.

Pending completion and issuing of such guides, the Joint Subcommittees stand ready to offer interim information. Advice that may be desired by any power company in starting a trial installation can readily be secured from the E.E.I. Chairman of the appropriate Joint Subcommittee, or through Edison Electric Institute headquarters.

The Immediate Opportunity

It is opportune to undertake joint surveys of conditions in those rural areas seeming to promise benefit from cooperative procedure in extending power and telephone services. Just at the present stage, it is believed, a company will make best progress by starting with the working out of a trial installation. This procedure is neither difficult nor costly, so long as it is dealt with tentatively and for reaching a sound basis for subsequent expansion. The more widely distributed and prompt the experience gathered from these trials, the more representative and the sooner can conclusions be drawn for full economic participation. Electric utility executives will find timely concern in joint power and telephone services to the farms as offering mutual public and industry benefits.

Kaiden—Keystone Studios

A. E. SILVER

Has been consulting electrical engineer, Electric Bond & Share Co. and Ebasco Services, Inc., 1910 to date. Obtained his early experience with General Electric Co., Schenectady. His work with Bond & Share and Ebasco Services has included charge of design of generating stations, substations, transmission and distribution systems

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

FARM ELECTRIFICATION

G. C. NEFF, President, Wisconsin Power & Light Co.*

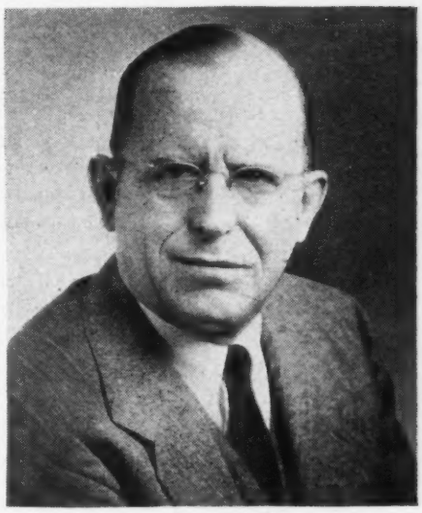
AS of December 31, 1945, 3,020,000 farms, or 50.8 percent of all farms in the United States, were using electric service. In addition, the electric lines that serve a little more than half the farms in this country bring electric service within easy reach of many other farms where, for one reason or another, the farm homes are not connected to such lines. It is estimated that 900,000 farm homes in the United States that are not taking electric service are within one-quarter mile of existing electric lines.

As of December 31, 1945, the electric operating companies were serving 1,811,000 farms, REA co-ops were serving 1,050,691 farms, and all others were serving 159,000 farms. Distributing the farms reached but not served on the basis of percentages served, we can assume that the operating companies have made service available to 2,351,000 farms, the REA co-ops 1,356,000 farms, and all others 213,000 farms.

Finished by 1949

Based on estimates and a study of past records we can arrive at these predictions for the end of 1948: operating company service within reach of 2,951,000 farms; REA co-op service, 1,956,000 farms; all others, 253,000 farms. This forecast is for a total of 5,160,000 farms. Inasmuch as there are now only 5,950,000 farms in the United States and the number is decreasing, and inasmuch as many of these farms do not have any buildings on them, it can be seen that the big job of extending electric lines to the farms of this country will be about completed on December 31, 1948.

It is true that there will be quite a large number of farms along existing lines that will have to be connected, and short extensions will have to be built in many cases, but those developments will be taken in stride and will not present a big problem.



GROVER C. NEFF

Mr. Neff entered the utility field as a resident engineer on construction work in Wisconsin. After holding various operating positions with Wisconsin properties, in 1922 he was appointed vice-president of the Wisconsin Power & Light Co. and is now the president of that company. He is chiefly known for his contributions to the movement for farm service

The job of proper rural electrification is not finished when all farmers who wish to have electric service have it. The principal objective of rural electrification, in addition to furnishing light, is to get electric power efficiently applied to as many farm jobs as possible in ways that are profitable to the farmers. The building of electric distribution lines is necessary but is only a means to an end, and a farmer does not necessarily have profitable rural electrification when a line has been built and service made available in his house and barn. As utility people, we have a big job on our hands to do whatever we can to get electric service at work on the farms of our customers in a manner profitable to the farmers.

As new and better ways are found to apply electric service to farm operations, the farm customers must be made acquainted with the new and better methods and sold on the use that they should make of them. It seems to me that it requires, as a minimum, one farm service man for each 1,000 farm customers. There are very few power companies with that many and to that extent I believe the development of the farm load is being neglected.

We in the utility business should realize that REA co-ops are here and that they will continue to furnish an appreciable part of the farm electric service used in this country. These co-ops will be operating in territory adjacent to that served by the operating companies. It seems to me that it would be wise for us to approach their directors in a spirit of friendliness and in a cooperative manner. It should be possible to work out with them, in a friendly way, a division of the territory yet unserved, based upon the sound economics of each case.

Publicity Needed

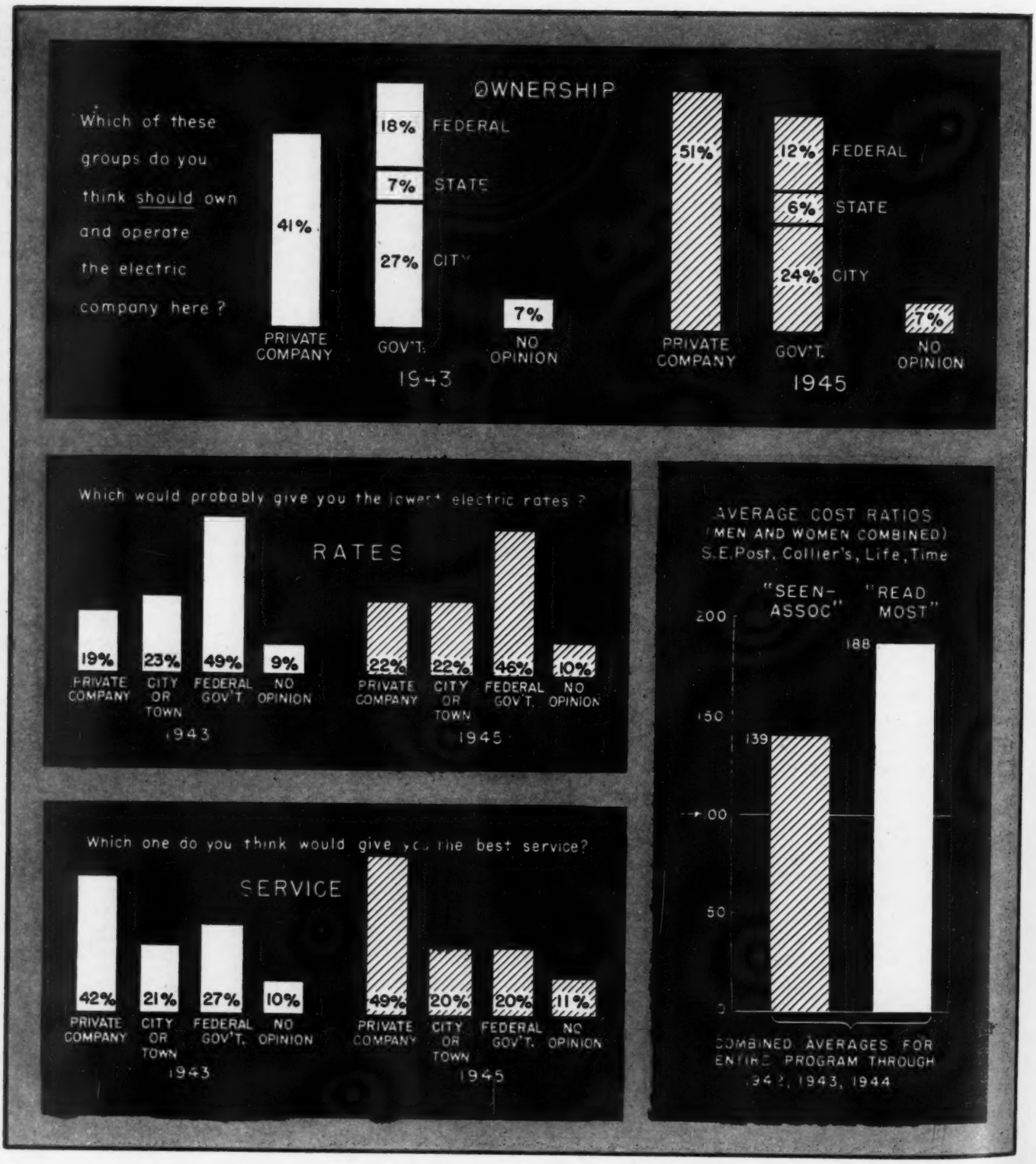
We should also review the publicity programs of our companies and amplify them to give the general public more and better information on the fine job that our companies have done in extending service to the farmers. During the '20s, our companies did the pioneering in rural electrification. We were responsible for the development of new standards of construction and new lines of farm machinery suitable for electric drive. We have built hundreds of thousands of miles of electric lines. Today we furnish retail electric service to 60 percent of all farms served in this country and supply wholesale a majority of the electric power sold retail by the REA co-ops. Our record in rural electric development is good and is worth talking about.

The operating companies of the United States started rural electrification; they have developed it at a reasonable speed. Let us now do the things necessary to carry it on to an early and successful conclusion.

---

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

Electric Companies ADVERTISING



PROGRAM

P. H. McCANCE, President, Duquesne Light Co., Pittsburgh, Pa.*

IN 1941, 52 LIGHT AND POWER companies decided they could get results in improved public attitude towards the industry through a national advertising program. The purposes of the program were to win friends, to convince people that business-managed electric supply had done a good job and that no other agency could do a better one.

The program included, (1) advertising in national magazines, general and farm publications, (2) mat service to companies for local newspaper advertising, and (3) a national radio program.

At present, national advertising space is 119 pages per year in 8 general and 6 farm magazines having total circulations of 11,800,000 and 7,600,000, respectively. Magazine readership studies of the advertising in *Saturday Evening Post, Colliers, Life,* and *Time,* show that as against the average of all advertising in those publications in 1942, 1943 and 1944, that of the power companies had ratios of effectiveness in relation to cost of 139 percent in terms of the advertising being seen and recognized and of 188 percent in terms of being read.

In 1945, 120 companies used the mat service in 2,976 local papers per month, these papers having a total circulation of 20,526,000.

The Sunday afternoon radio program uses the full network of the Columbia Broadcasting System of 143 stations and it reaches 28,150,000 families, 83 percent of all those that have radios. The Hooper rating of the program in the first year was 6 percent and in the second 7½ percent. In its second year the "Electric Hour" has averaged fifth in rating among the 28 Sunday afternoon commercial programs on all four radio networks.

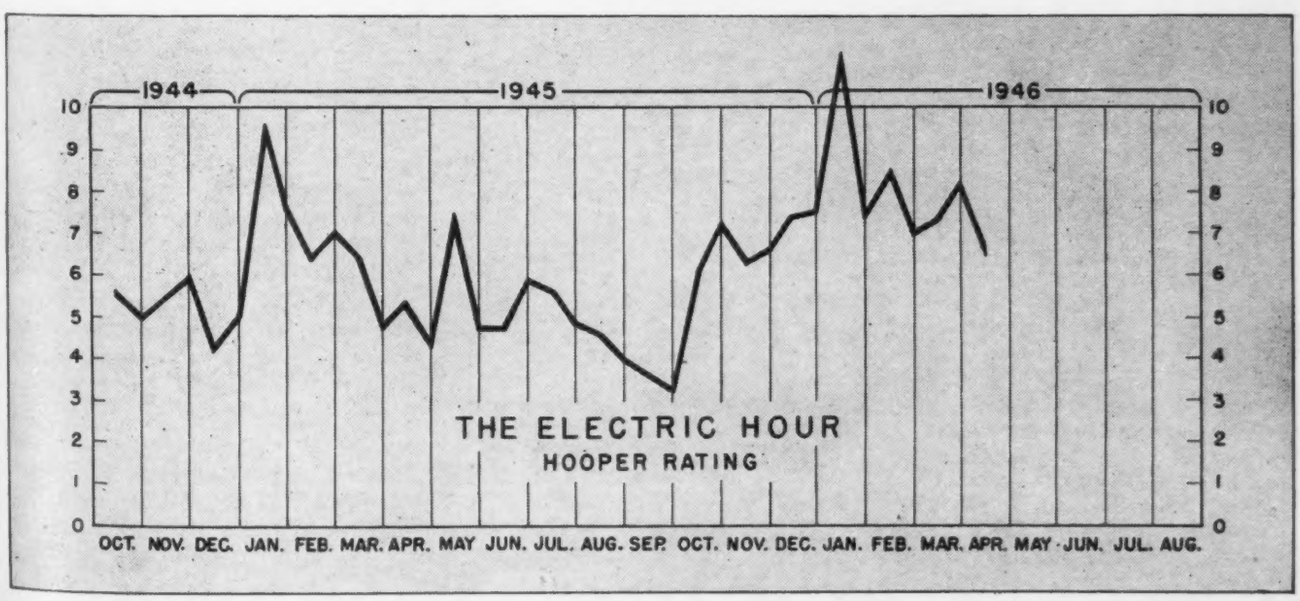
Studies of the effectiveness of the advertising program made in 1943 and 1945 by the Opinion Research Corporation show by comparison the results that have been obtained. They show, as is evidenced by the accompanying charts of replies to 3 of the 50 questions asked, that the general attitude of the public towards the power companies is changing definitely for the better.

* *Abstract of presentation at 1946 annual meeting of the Edison Electric Institute.*

Blank & Stoller

PRESSLY H. McCANCE

Has been connected with the Philadelphia Co. and its subsidiaries since 1923, starting as an attorney in the law department. He served as director of personnel from 1929 to 1938, was made vice-president of Philadelphia Co. in 1938 and was named senior vice-president of Duquesne Light and Equitable Gas Companies in 1940. He was elected president of Duquesne Light Co. in 1942



MORE POWER To America

W. V. MERRIHUE, *General Electric Co.**

MOST ELECTRIC utility executives will remember that a little over a year ago we presented our long-range plan to accelerate the modernization and electrification of American industry. Labeled the "More Power to America" program, this plan calls for the coordinated efforts of electric utilities, machinery manufacturers, electrical manufacturers, consulting engineers, and contractors to increase the efficient use of electricity in industry and agriculture, with emphasis on those processes least electrified.

Active aggressive participation in the program has not been easy to get started. For one thing, all partners of the alliance—utilities, manufacturers, consultants, and contractors—have in many cases been handicapped by lack of manpower even to handle business that came to them automatically. No salesman is eager to take on a creative selling job when his desk is already buried under an avalanche of orders, requests for service, or complaints about slow shipments.

WILLARD V. MERRIHUE

Is manager of the advertising and sales promotion divisions of the apparatus department of the General Electric Co. Mr. Merrihue started work in the editorial section of the company's publicity department in Schenectady in 1925 immediately after his graduation from the University of Pennsylvania. In 1933 he received a Charles A. Coffin Foundation Award

Slow Progress Not Surprising

Many utilities have found themselves with just enough generation or distribution facilities to get by under existing load demands until manufacturers are able to supply the new equipment already on order. We have all felt the effects of the wave of post-war strikes and material shortages. It seems that no sooner is one shortage alleviated than two more descend upon us.

Under such conditions, it would not be surprising if little progress had been made in putting the "More Power to America" program into operation. It is a tribute to the foresight of American utility executives to be able to report that, in spite of these obstacles, more than 100 utilities are putting the program to work in the communities they serve.

There is a most important reason for urging action now. The electrical industry has an obligation to help build a peace-time America that will afford our people the best in life and will protect the nation against the dangers of future aggressors. The American people, whose standard of living is already the highest in the world, are determined that it shall mount even higher.

This cannot be achieved by laws, or government regulations, or wage increases that necessitate higher prices. A higher living standard can only be achieved through increased productive efficiency. The real income of the American worker can be increased only as his productivity is increased through greater and more efficient use of electrical horsepower.

We have proved our ability to produce in war, where the sole problem was maximum production without regard to sale or cost. We must now find ways and means to produce and *sell* a comparable or higher volume in peace. We dare not take the attitude that we need war to create full employment and maximum production. The know-how that activated our war-time industrial machine must be made available to all industry. "More Power to America" provides an organized method for helping to accomplish this, so that all industries may increase production through the use of the latest electrical methods.

Thus, the two big jobs—production and selling—are recognized. Both of these jobs need adequate tools. We have proved that we have the ability and the tools to make things for war in quantities unprecedented and considered impossible only a short time ago, but in peace this production has to be sold, and this is going to require some new approaches and some real, creative promotional selling.

Must Prepare Now

Our efforts will be too little and too late if we wait until the last turbine now on order has been installed, until everyone has plenty of distribution facilities. Now is the time to train power salesmen, form alliances with manufacturers, consultants, and contractors, and start employing "More Power to America's" mass sales and educational tools wherever conditions warrant. This is a long-range program. But the longest journey begins, says the proverb, with but a single step. The time to take that step is now.

** Abstract of talk at 1946 annual meeting of the Edison Electric Institute.*

"PRODUCTIVE POWER"

J. M. McKIBBIN *and* C. B. STAINBACK, *Westinghouse Electric Corp.**

NEW electrical products and improved old products have been made available to American industry during the war, so that industry can produce better, in less time, and at less cost.

More than 70 percent of the electric power generated in America is already used by industry. The average American worker in industry has approximately 7 horsepower in machinery at his command, most of it electrically driven. The electrical industry is convinced that sustaining and improving the American standard of living is dependent on continued increase in the utilization of electric power in industry. "Productive Power" is a contribution to this nationwide effort to promote the further electrification of industry.

"Productive Power" is a traveling show, manned by factory-trained personnel, equipped with the best available properties and using many war-developed training techniques.

To present the possibilities of newly developed uses for electric power, sections of modern factories are being put on the stage for manufacturing audiences to see. This is a case of moving the mountain to Mohammed.

Industrial Applications Demonstrated

The show consists of seven sections, each describing new applications for electric power. Sections are devoted to resistance welding, which has contributed so much to improved machinery fabrication; high-frequency heating, which is revolutionizing many heat-treating techniques in American factories; infrared heating, which has reduced the drying time of paints and varnishes to minutes instead of days; adequate industrial lighting, which was tried out for the first time on a nationwide scale during the war; air conditioning and air cleaning with Precipitrons, which greatly improve working conditions and productive efficiency; furnace brazing, which takes brazing operations into the field of mass production; and lastly, adequate wiring, which is necessary if American industry is to use the many new applications of electricity available to it.

It is planned that within the next year this show will be put on in most all of the cities in the United States having a concentration of industrial activity. The elaborate properties used in depicting the new benefits of electric power will be set up in the largest auditorium available in selected cities. Representatives of all industries will be invited to the show for a full day of dramatic presentation of industrial techniques and equipment.

Actual machinery, such as high-speed electronic welding apparatus and high-frequency oscillators, are set up on the stage. Audience participation is invited in the show so that individuals can go up on the stage and weld together sections of steel sheeting. The electronically welded steel sheet is then compared in a large tensile testing machine with riveted joined sections of steel sheeting. This demonstration effectively shows that steel sheeting can be instantly joined by high-speed electronic resistance welding in a faster and better manner than the old-fashioned riveting method.

As most of the engineers and operators of the hundreds of thousands of small factories all over America cannot visit installations of new and revolutionary electrical equipment, "Productive Power" will take replicas of installations into the home towns of such industries for them to see personally. Scheduling of presentations of "Productive Power" will be made through the electric utilities serving the areas where the showing will be put on.

J. M. McKIBBIN

Mr. McKibbin joined Westinghouse in 1922 and is now in charge of company product and industry advertising as assistant to the vice-president

C. B. STAINBACK

Has been with Westinghouse Electric Corp. since 1910, and at present is manager of the industrial department of the corporation

* *Abstract of presentation at 1946 annual meeting of the Edison Electric Institute.*

Electric HOUSE HEATING

in the Pacific Northwest

JAMES H. POLHEMUS, President, Portland General Electric Co., Portland, Ore.*

AT THE PRESENT TIME there are more than 700 electrically heated dwellings and apartments connected or on order on lines of the Portland General Electric Co., and our sales departments are receiving 30 to 40 inquiries daily. The present demand for electric house heating probably had its origin in the promotions of auxiliary electric heating carried on in the years prior to the war, which demonstrated to considerable segments of the public the automatic, cleanliness and low investment advantages of electric heaters and gained a large degree of public acceptance of the electric heating idea. Our proximity to the Booneville and Coulee projects, the excess Government power available from them, and the efforts of BPA administrators to develop usage of these surpluses also has stimulated the demand for electric heat.

Having virtually no experience in serving full electric house heating loads when the first installations began to come on our lines back in 1939 and 1940, our company adopted an experimental attitude toward them and in 1941 opened our existing general residential schedule to house heating installations having a connected load in excess of 6 kw., which we classed as an experimental load requiring prior approval of the company. We accumulated approximately 200 installations prior to the outbreak of the war, which precluded carrying out the tests contemplated at that time

Not until September, 1945, were a suitable number of meters obtainable for commencing the load characteristic studies we had planned. At that time we selected 75 test dwellings on the basis of size, location, connected load, and method of heating as a suitable cross section of users, and upwards of $50,000 was appropriated for the necessary equipment and technical personnel required to make a thorough analysis of the heating load over a full twelve-month period. Objectives of the tests primarily were to determine (1) the load and diversity characteristics of electric heating, (2) power costs, and (3) distribution costs

From the primary data we shall be able to derive a new house heating rate that will cover our costs plus a reasonable return on investment. As an interim measure pending the outcome of present investigations, the company last November made effective a new all-electric residential schedule offering customers having ranges and water heaters substantial savings and allowing unlimited house heating subject to a demand charge assessment for demands in excess of 10 kw.

The two heating methods in general use are unit resistance heaters thermostatically controlled in each room, heating by a combination of radiation and convection, and central warm air furnaces heating through ducts by forced convection, also thermostatically controlled. Curves are being developed for each type. These curves seem to indicate fairly positively that the peaks and energy consumed have consistently been less for unit heater systems than for central furnaces. The composite demand measured at the customer's meter at the time of the system peak on December 20 of last year averaged 6.4 kw. for central furnaces and 5.3 kw. for unit heater systems.

Also fairly conclusively demonstrated from the data so far at hand is the fact that the cost of power to serve a heating load, under the present kilowatt-year rate at which we presently must purchase federally generated power from Bonneville Power Administration, approximates 8½ mills. To this we must add our distribution cost, yet to be determined from our present experimentation. Obviously a resale rate for consumers generated from these costs certainly cannot be lower than the interim schedule now effective (which averages out at approximately 9½ mills) unless the basic conflict between the highly seasonal nature of electric house heating load and the kilowatt-year rate for federal energy is resolved by a satisfactory modification of the government's whole rate structure.

The Bonneville Administration is aware of this problem and has advised us informally that they have in mind a straight kw.-hr. rate of 4½ mills for energy to be resold for house heating.

J. H. POLHEMUS

Began his engineering career with U. S. Engineers on The Dalles-Celilo canal. Served with Coos Bay Shipbuilding Co. and the Port of Portland before becoming executive vice-president of the Portland Electric Power Co. and its affiliated companies, in 1936. In 1940 he was made president of Portland General Electric Co.

** Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

. . . *in the South*

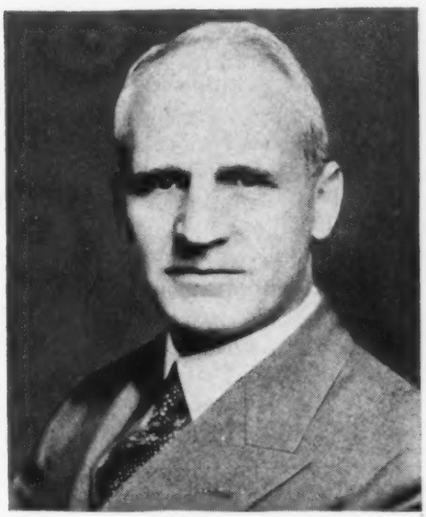
J. M. BARRY, Vice-President, Alabama Power Co., Birmingham, Ala.*

IN ORDER TO GET a cross-section of opinion and actual results of house heating in the Southeast, the Southeastern Electric Exchange sent out an inquiry to many of the principal utility companies in our part of the country. The results of this inquiry show that, except for two or three experimental installations, electricity for general house heating is not being promoted by the companies. Nearly all companies reported the use of auxiliary room heaters in sizes varying from 500 to 3,000 watts. No special rates are offered for the latter type of service. These uses are justified on a basis of their special convenience. In addition to the results of this survey, it should be reported that distributors of TVA power throughout the Tennessee Valley were in 1944 serving about 1,000 electrically heated homes.

On a strictly competitive cost basis for varying fuel prices effective throughout the area, the equivalent electric rate would have to be from 2.0 to 3.5 mills per kw.-hr. Advantages of electric heat would justify a somewhat higher price for electricity than this, but the spread is still too great for electricity to be broadly competitive.

A good many of the utilities in the southern part of the country have already felt, or will soon feel, the impact of summer air-conditioning. Even before the war, peaks of some of these utilities shifted to the summer as a result of air-conditioning and refrigeration loads. The summer air-conditioning load will continue to grow rapidly, presenting a serious problem to the utility companies. Up to the present time the companies with which I am associated have, however, had very little experience with summer residential air-conditioning.

From the meager data available, it appears that the diversified annual load factor of residential summer cooling will be about 5 percent. On the other hand, a combination of winter heating and summer cooling may have a diversified annual load factor as high as 25 percent, if such service can be accomplished with the heat pump. These conditions have prompted some of our utilities in the Southeast to sponsor a research program to explore the possibilities in this field. As announced in March, a contract has been made between the Southeastern Electric Exchange and Southern Research Institute of Birmingham to survey the present status of heat pump development, the plans of manufacturers for its future, the activities of the utilities in this field and their plans for promoting its use.



J. M. BARRY

Mr. Barry obtained wide engineering experience with the Pacific Gas & Electric Co., Northwestern Electric Co., the Department of Electricity of San Francisco and the Great Western Power Co. before joining the Alabama Power Co. in 1918. After a connection with the Dixie Construction Co. he returned to the power company and in 1932 became vice-president and general manager, his present position

We believe that the heat pump for year-round air conditioning (summer cooling plus winter heating) could be made competitive, service considered, with coal, oil, and natural gas in the South at rate levels between 1 cent and 2 cents per kw.-hr. At what level a utility company can afford to sell electricity for such service is another question. Even taking the 25 percent annual diversified load factor said to be possible for year-round heating and cooling with a heat pump, a kilowatt of load at that annual load factor would, at a 1 cent rate, produce only $21.90 revenue. If the energy component of cost is taken at 3 mills per kw.-hr., there would be left only $15.33 to cover the annual demand component of cost per kilowatt. This amount is not sufficient to cover in full all other costs of delivery to a residential customer on a distribution system. It is my opinion, therefore, that a rate of 1 cent per kw.-hr. would be inadequate if we look ahead to substantial saturations of such 25 percent load factor residential loads.

It is not desirable, in my opinion, to attempt to sell electric power for house heating unless the advantages of such service will be so evaluated by the customer that he will be satisfied without unduly preferential rates. With these considerations in mind, we conclude that the only way to make electric house heating practical in our area is to develop the heat pump to improve its coefficient of performance and otherwise perfect it for the dual job of summer cooling and winter heating; and to make its application economically feasible. Therefore, it seems to me that we should, as an industry, actively work toward these ends.

* *Abstract of paper at 1946 annual meeting of Edison Electric Institute.*

Towards Better Understanding

P. L. SMITH, President, National Association of Electric Companies*

IN short form the aims and purposes of the National Association of Electric Companies are stated:

"In order to further the interests of the electric utility companies that are members of this Association and their investors, employees and customers; to maintain the integrity and credit of the industry; to present to the public the essential facts about the industry to the end that there may be a better understanding between the utility companies and the public and a better appreciation of utility progress, achievements and problems; to coordinate regional activities among member companies; to furnish member companies information, reports and statements concerning various phases of electric utility operations and developments; to further cooperation with all agencies and organizations interested in the supply and purchase of electric light and power; to furnish such agencies and organizations with information, reports and statements concerning member companies and the electric utility industry; to present the facts to the public concerning the public benefits resulting from the operation of electric utility companies by business men under governmental regulations and, generally, to engage in those practices recognized as being legal and proper to further said ends, certain electric utility companies do hereby establish a national association which shall be adequately qualified and empowered to act in every lawful way when concert of policy and action would be helpful."

PURCELL L. SMITH

Mr. Smith had been president of Middle West Corp., and chairman of the board of Middle West Service Co. since 1937, when he resigned last year to become president of the National Association of Electric Companies. Prior to his association with Middle West, Mr. Smith had been vice-president in charge of finance of Commonwealth Edison Co. Mr. Smith entered the utility field in 1916 from the investment firm of Lee, Higginson & Co., joining the North American Light & Power Co.

Membership Nation-Wide

The need for such activity, in addition to the activities of the Institute, the Association of Edison Illuminating Companies, and the advertising group, has long been recognized by a majority of the companies in the industry. Many are familiar with the discussions over a period of years and of the various committee meetings of the Institute and other groups prior to the eventual formation of the new Association, which was established in August of last year. Today 107 companies are members of this Association and they constitute about 60 percent of the volume of electric light and power business done by all of the companies in the industry. Membership is made up by companies from nearly every state in the Union and, therefore, is concerned with the various problems, viewpoints, and geographical distinctions of the entire United States as they relate to the power company business.

Coordinated activities of the member companies and the Association staff to date include—

1. A number of meetings for assembly of factual data, plans for its utilization and actual use of it heretofore and in the future.
2. Several group conferences on public relations and publicity techniques and programs.
3. Distribution of data and informational documents to member companies.
4. Coordinated appearances of executives before congressional committees concerning REA legislation, several appropriation bills and authorizing legislation.
5. Discussion and contacts with the U. S. Army Engineers and a number of the administrative agencies and commissions.
6. Formation in cooperation with the American Farm Bureau Federation of a National Committee for Electric Service to Farmers, to be broadened by invitation to REA and other bodies; for a general program of stimulation of extension of service to more farmers, research looking to improvement of electrical equipment for farm use, and the most efficient and economical methods of application of electricity on the farm, etc.
7. Participation in the comprehensive income tax study being made under the supervision of Professors Dorau and Foster.

In each of these activities beginnings have just been made and accumulated experience and benefits are some of the stepping stones for larger and more effective accomplishments in the future.

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

Post-War Labor Trends

H. K. BRECKENRIDGE, *West Penn Power Co.**

OUR INDUSTRY has been characterized by generally good levels of wages and by consistent stability of employment. In the reconversion period there have had to be fewer cutbacks in working hours, and therefore less reduction in take-home pay than in many other industries. For these reasons the increases in wage levels in our industry since V-J Day, while substantial, have not been as great as the national wage patterns established in the oil, steel, or automotive industries.

New Problems for Management

Although the electric utility industry has not had as much labor difficulty as many other industries since V-J Day, we have felt the effects of many current labor trends which pose new problems for utility managements. More unions in our industry mean increased collective bargaining problems. Strike threats mean that both managements and unions must find a better, but still fair, way to settle their disputes without interruption of service to our customers. Higher wage rates make it more than ever necessary that we increase operating efficiency and keep labor productivity at the highest possible level.

Our industry is meeting these problems in several ways:

First, we are increasingly better informed on employee relations matters within our industry. Recognizing that too often the national unions with which we deal are better informed than the company representatives at the bargaining table, the Edison Electric Institute Industrial Relations Committee has continued to sponsor interchange of information on employee-relations matters both through informal meetings and through questionnaires. Efforts are now being made to establish a close liaison with regional associations of electric utility companies where they are meeting and discussing labor-relations matters.

Second, our industry has recognized the growing importance of labor relations through the development of more effective industrial relations departments. In general, industrial relations staffs conduct research, advise on policy, participate in collective bargaining, and carry out many phases of personnel programs. The importance of a sound employee-relations program has outgrown the days when these functions can be only a part-time job of an otherwise busy executive. At the same time, all operating executives are being made increasingly aware of the importance of good employee relations in the conduct of their jobs. The employment of specialists to work in the industrial relations field exclusively should in no way minimize the responsibility of every supervisor for conducting his part of the job of building good relations between men and management with both union and non-union employees.

Build Sound Employee Relations

Third, and most important, is the recognition that the key to most of our labor problems lies in the continual building of sound employee-management relations. The importance of good employee relations has long been recognized in our industry, and it has never been of greater importance than it is today. A satisfied, cooperative employee working under a supervisor who has earned the respect and cooperation of his men will give his company full value for today's higher wage levels. A dissatisfied employee will be costly to his company even though he is paid a much lower wage. Careful selection of new employees, proper training for their jobs, fair wage and salary administration, adequate welfare and health programs—these and many other personnel techniques have been used for years and are more than ever essential to good management.

In the electric utility business, where we are dependent upon the good will of our customers if we are to continue in business free from political management, we have a tremendous stake in seeing that we overlook no opportunity to insure that our employees feel their company is soundly managed, has progressive policies, and is interested in the welfare of all its workers. To the extent we do this, we need have no fear of either today's or tomorrow's labor trends.

H. K. BRECKENRIDGE

Was graduated from Columbia University with A.B. and M.E. degrees in 1925 and has been continuously associated with the West Penn Power Co. or its affiliated companies since that time. At the present time he is assistant to president and personnel director of West Penn Power and West Penn Railways Companies. Mr. Breckenridge has been chairman of the industrial relations committee of E.E.I. since its formation

* *Abstract of paper at 1946 annual meeting of the Edison Electric Institute.*

EDITORIALS

S. B. WILLIAMS, *Editor*

Special Provisions for Utilities in Case Bill

ALTHOUGH the prediction is that President Truman will veto the Case labor bill as passed last week by both House and Senate, the public position was greatly improved by the recognition of the difference between utilities and interstate industry generally. While the bill as passed did not go so far as to ban utility strikes or as to make arbitration compulsory, it in effect has put utility workers in a position where they have everything to lose and nothing to gain by walking out.

Congress by its vote has shown that it well understood the desires of the people. In our May 25 issue the poll of electricity users showed that the public, while willing to permit general factory workers the right to strike, were opposed to giving electric utility workers the right to strike by a vote of 48 percent to 29 percent. The United States Senate vote on the Case bill was 49 to 29.

It was clearly indicated in the poll referred to that there is no public resentment towards utility workers even in places where there had been a strike or a threat of a strike. They will have public backing for fair wage treatment even if it means higher light bills. They just must not deprive the public of service. With such an attitude on the part of the public, utility labor would be well advised to accept the provisions of the Case bill. If a measure as mild as the Case bill does not succeed in bringing industrial peace then utility workers, at least, can expect compulsory arbitration. Our poll showed the public 92 percent in favor of arbitration.

In the past the obligation has been placed on the shoulders of management to make the labor relations law work. The Case bill, in effect, makes labor responsible and punishable also. This action, however, in no way lessens the responsibility of management in its labor relations. Public insistence upon continuity of service imposes a strong obligation on the part of both labor and management to do everything possible to prevent a work stoppage.

A glance at the record will show that the average electric utility worker has always been paid better than the average industrial worker. What is more he has had continuity of employment, special benefits and other considerations not generally enjoyed by other workers. Why he should strike under such conditions is a mystery the public will never understand.

Lost Time Is A Continuing Problem

LABOR COSTS in distribution have risen steadily in the past few years and may go still higher. This is not just a question of wage rates, nor even of labor efficiency out on the job. Pole holes dug by top linemen, for instance, were not unusual during the war. Shortages of material also have contributed to the labor cost by delaying job progress. Time lost for many reasons can remain as a problem long after these troubles are gone.

Lost time is not a new factor in costs, but it offers one of the most important opportunities for superintendents to prove their resourcefulness in supervision. It may be at the beginning of the day—waiting for job assignments or for material—or at the end of the day—when the assigned tasks are completed, or could be. Time may be lost between jobs—moving from one job to another miles away. A portion of the total time on a particular order may be lost because a four-man crew is assigned to a two-man job.

Big construction projects offer less of a problem in lost time consideration than do the hundreds of service changes, rearrangements and short extensions which account for the major part of distribution cost today. Reduction in the size of average work order adds emphasis to the importance of job dispatching.

The jig-saw puzzle of factors—workers available in particular crews, man-hours estimated for each order, location, material, and often of dates scheduled for service to a customer—can not be put together by pulling jobs out of a stack. Crew and work organization must be considered together. Present difficulties in material will gradually clear, just as help shortages are already passing. Lost time, however, will not be cleared by requisitions or employment applications. It is up to foremen and superintendents.

Demand Metering Needs Fresh Study

INASMUCH as indicating meters were devised long before the principle of the induction watthour meter was discovered by Shallenberger, one would have expected the indication of maximum demand to be a simple matter of devising a pointer system that would leave the index at the highest point reached. That hope has never been realized merely because instantaneous demand was not the quantity desired (some welding and furnace loads have recently prompted a search, however, for just that kind of a demand meter).

It would not be sticking one's neck out too far to say that the ideal and universal demand meter does not exist nor the perfect demand rate either. It may even be said that the signs indicate that all of us are more or less slaves to the Hopkinson demand tradition and to the idea that

prevailing forms of mechanical and thermal meters are the ultimate.

With a new load-building program ahead this whole question of demand deserves a fresh uninhibited study. How much should the stimulus of promotion replace the restraints of demand limitations and charges? Is the demand charge a deterrent to greater usage that would fill valleys? Is the demand charge an accurate image of costs to serve? Can it be? If not, why should there be so much effort to achieve accuracy in the demand meters themselves? If refined accuracy is not needed then maybe a less complicated and less expensive device would serve the logical objective.

And quite apart from this matter of more or less sustained demands is the question of a demand indicator for the bumpy peaks caused by certain kinds of welding and furnace operation. New load of that nature is bound to increase considerably in the next few years and since it has some undesirable characteristics the demand metering and the charges could be as precise and as deterring as the circumstances warrant—short, of course, of ruling out useful industrial practices.

The Lesson of the Coal Strike

JOHN LEWIS may have won the coal strike but the price to the coal industry and to the miners may in the long run outweigh the immediate benefits to the workers. Certainly as far as power production is concerned the threat to electric service continuity has given to water power a stronger competitive position than it previously had, has given added impetus to provision for alternative fuels in boiler design and has created added argument for customer-owned oil engine power plants.

Pricewise, the higher cost of coal is bound to improve the competitive position of water power and other fuels, but that is not nearly as serious as the threat to service continuity. For that reason power producers will be less likely to place so many eggs in one fuel basket. When two to three months supply of coal is not enough to tide a company over almost any emergency the answer isn't in a bigger coal pile. A considerable number of companies will find the solution in an alternative fuel supply.

The May fuel scare was enough to cause utility managements to lay plans never to get caught again. While the loss to the industry as a whole was not serious, the lesson taught was unmistakable.

Light Is Invited Into the Retail Liquor Trade

IF they go on his list at all, it is probably at the very bottom that the commercial lighting salesman puts down the names of liquor stores and taverns as prospects. And as he goes along the street calling on potential customers, he usually walks right past these places because he thinks—with more than a little justification—that a dim, but far from religious, light is an integral part of the business of selling liquor for consumption on the premises.

But as "Sportin' Life" sings in "Porgy and Bess," "It ain't necessarily so"; in fact it necessarily is not so, not if liquor retailing is to be the clean, respectable business that Licensed Beverage Industries, Inc., wants to make it. This organization has inaugurated and is carrying on vigorously a "clean-up-for-good-will" campaign among retailers of liquor. An essential part of the campaign as set forth by L.B.I. is good lighting, it being realized that customers not only are entitled to see but should be made to see what they are drinking and also their surroundings and themselves as they drink.

Here is a segment of retail trade that, looking at itself in the shadow where the mean and wicked and ignoble attributes of humanity like to hide, invites light to come in. The conviction is, as has been proved many a time in street lighting, that as light moves in these unlovely attributes move out. There are in the United States approximately 111,300 taverns, restaurants and other establishments where liquor is sold by the drink, also some 37,000 package liquor stores. These places are a considerable market for modern lighting. Aided by the best element of the business, as represented in the campaign of Licensed Beverage Industries, the lighting salesman should find that market a receptive and profitable one.

First Electrical Engineering Equipment Show Again Planned

SIX years ago plans were made for the first exposition of electrical engineering equipment to be held at the time of the winter meeting of the American Institute of Electrical Engineers. Almost at the last minute, however, it was felt advisable to postpone the show because of war conditions. Now these plans are being revised and the exposition is announced for next January in New York.

By that time manufacturers should be in a position to show a number of new designs that will be ready for production. It would not have been possible to do so any earlier due to the market, labor, materials and production situation. But even if a large number of brand new designs are not shown the interest will be high because the engineers are hungry for the sight of the new shining apparatus. Also in the past six years there have been changes and improvements, much of which many have not seen.

As we said when the exposition was first announced in the summer of 1940, there are shows of all other major engineering equipment which regularly attract thousands and it seems about time that the electrical engineers had a similar opportunity at regular intervals. Just as other engineering shows occur concurrently with meetings of the appropriate national professional society, so it seems in order that the electrical show take place at the time of a national AIEE gathering. The two, though independent, should supplement each other and be mutually beneficial.

WASHINGTON COMMENT

By R. N. LARKIN Washington Correspondent

REA Arguments Against Lowest Bid Requirement

THE Senate Appropriations Committee has stricken from the 1947 Agriculture Appropriation Bill a House-approved amendment requiring REA-financed cooperatives to award contracts to the lowest qualified bidder when federal funds are paid on such contracts.

In its report, the committee cited the six arguments which REA Administrator Claude R. Wickard made against the House proviso in testifying before the committee.

Storm Damage Argument

Wickard's first point against the House amendment was that it "would delay the rebuilding of lines damaged or destroyed by storms," which, Wickard added, must be done promptly and can only be done by a contractor. Competitive bidding, he said, would delay reconstruction.

Actually, Wickard and his deputy, William J. Neal, subsequently testified that almost no "storm damage" loans have been made by REA. This means that storm damage repair to REA-financed lines customarily is financed other than by new loans. Since the amendment applies only to new loans by REA, the point seems poor.

Neal testified further that were a new loan to be made for storm damage repair, REA would have to approve it. Another witness testified that, for want of manpower, REA is "bogged down constantly." These two points indicate that, were a new loan required, there might be as much delay in repairing storm damage through REA's own workings as through the workings of the House proviso REA now opposes.

Then too, REA announced last January that co-ops in 21 states would be unable to obtain further loans because funds for those states had been exhausted. Suppose REA systems normally repaired storm damage through new loans, as Wickard's point implies. What possible delay that might arise from competitive bidding could compare with the delay that would arise when REA found itself out of loan funds for a given state requiring a storm damage loan and had to withhold such loan pending enactment of new loan authorizations or a modification of the loans-per-state formula?

Another Wickard point against the House proviso is that it would "prohibit borrowers from considering the time of delivery as a factor in awarding contracts for shipment." If it be worried about prompt delivery—and who isn't these days—REA might include in its contracts a stipulated delivery date, just as it includes specifications as to quantity and quality.

Consulting Engineers' Fees

What appears to be a weakness of the House proviso is highlighted by another of Wickard's points against it. Wickard asserted that "the proviso would create uncertainty as to its application with reference to engineering and wholesale power contracts." Consulting engineers, he said, normally are chosen on their qualifications and paid a fixed fee. It is questionable, Wickard added, that professional ethics would allow competitive bidding. This point could readily be eliminated by exempting engineering and wholesale power contracts. As for the latter, however, the situations wherein there are two possible suppliers are, by the very nature of the power business, limited. Furthermore, the U. S. Comptroller General has ruled time and again that where no possibility of competition exists, no advertising for bids need be performed.

Wickard's next argument against the House proviso is that it "raises a serious question as to whether a borrower could award a contract on the basis of the lowest ultimate cost as against the lowest first cost." This seems certain to evoke loud cries from the contractors, who will insist that they merely build to the specifications, said specifications having been prepared by the co-op's engineers and approved by REA. Granted that no one can design today a system which will be the best possible system 35 years hence, the co-op has recourse at law against any contractor who would substitute his own judgment for installation specified in the contract. More immediately, it could and would refuse any payment which might be or become due on work not performed according to specification.

Local Responsibility

Wickard's final argument is that the House proviso would "detract from the spirit of local responsibility and freedom of action on the part of our borrowers which have been important factors in the success of the REA program to date. It would impose upon REA borrowers rigid forms of control such as have never been imposed upon any other borrowers of federal funds." The local freedom of action which Wickard values so highly, however, is a two-edged sword. If local freedom of action be curtailed by requiring acceptance of the lowest qualified bid, how is it any less curtailed when REA requires that a bid not be permitted, or be disregarded if it be submitted? (This is admittedly REA policy in specific situations.) Wickard revolts against the imposition of Congressional judgment on a local situation as dangerous to local autonomy. His solution is to impose REA judgment.

REA may argue, of course, that it must maintain relatively close supervision over the uses to which its loan funds are put because the program, by law, must be self-liquidating. The argument is fair enough. But it is a mockery of logic for REA to advance the "freedom of action" issue so long as the very nature of its own job constitutes a real limitation on local freedom of action. REA's record in the copper vs. aluminum conductor fight, its insistence on its own judgment as to co-op engineering and legal personnel, and its insistence that co-ops must follow its rules in letting contracts are too apparent to be overlooked. Its position in these matters does not add up to local autonomy.

NEWS OF THE WEEK

Neff Elected President at Annual E.E.I. Meeting

Wisconsin Power & Light Co. Head Will Succeed C. W. Kellogg on July 1—Will Serve Part-time without Salary—3-Day Program Attracts 806 Registrants

EXECUTIVES of practically every important privately owned electric utility in the United States were present this week in New York as the Edison Electric Institute held its first annual meeting since 1944. Attendance reached 806 persons including representatives of electrical manufacturers and trade journalists.

Twenty-two formal addresses were given on 20 topics varying from servicing electrical appliances to the development and use of atomic power. In between were the many other topics of interest to management such as labor, sales, electric house heating, finance, public relations, taxes, and government activities in the power field. Many of these papers are abstracted in the main section of this issue of ELECTRICAL WORLD.

Charles W. Kellogg, who has served full-time as president of the institute since 1939, was succeeded by Grover C. Neff, president of the Wisconsin Power & Light Co. Mr. Neff was elected for a one-year term. He will retain his position with the Wisconsin utility and will serve the institute on a part-time basis without salary.

Col. Bennion Will Assist

Much of the actual management of the institute's affairs will fall on Col. H. S. Bennion, who was reelected vice-president and managing director. The other vice-president will be Pressly H. McCance, Duquesne Light Co. K. B. Crumb, American Gas & Electric Co., was elected treasurer, and Mae B. Woods, secretary.

Added to the board of directors were J. E. Loiseau, president, Public Service Co. of Colorado, and J. W. Whiting, president, the Commonwealth & Southern Corp., for terms expiring in 1948; A. H. Kehoe, vice-president, Consolidated Edison Co., and E. L. Lindseth, president, Cleveland Electric Illuminating Co., for terms expiring in 1949.

Mr. Neff, who will take office on July 1, has been president of the Wisconsin Power & Light Co. since 1933 and has been in the utility field since 1908. He has served in executive capacity with the Southern Wisconsin Power Co., Wisconsin River Power Co., Wisconsin Power, Light & Heat Co., Mineral Point Public Service Co., Janesville Electric Co., Eastern Wisconsin Electric Co., and the Middle West Utilities Co.

He was graduated from Purdue University in 1907. Born on a farm near Milford, Ind., in 1886, Mr. Neff throughout his career in the utility industry has been a strong advocate of extending electric service to farmers.

He was chairman of the Rural Electric Service Committee of the National Electric Light Association from 1922 to 1927 and secretary and treasurer of the Committee on the Relation of Electricity to Agriculture from 1923 to 1939.

From a Canadian, Huet Massue, consulting engineer of Montreal, came a denunciation of the Tennessee Valley Authority in the cold, statistical analysis of an engineer. Mr. Massue criticized TVA as being "costly and uneconomical."

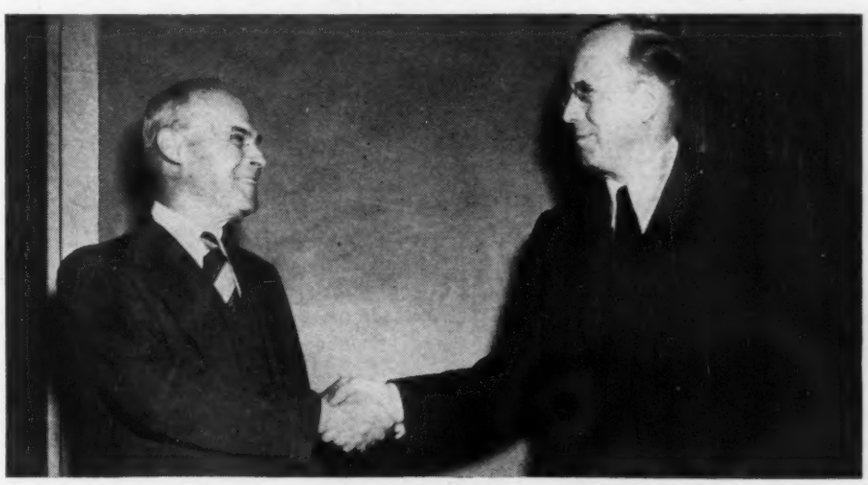
The investment of TVA in its hydro projects averages $338 per actual kilowatt installed, which is more than twice as high as the average investment in hydro facilities of privately owned electric utilities in the United States ($167) and in Canada ($162), he claimed.

He also denied that TVA brought to its territory a larger increase in industry than many areas served by privately owned electric utilities had and that the residents of the TVA area had enjoyed higher wages than workers elsewhere.

Using Bituminous Coal Research, Inc., as an example, J. E. Tobey, chairman of the Technical Advisory Board of B.C.R., stressed the value of research. He said that the electric utility industry needs research converging from three different directions, its associated industries (equipment manufacturers), its individual companies, and itself.

Utilities were advised to encourage small industries by Thomas N. McCarter, Jr., executive vice-president, Public Service Corp. of New Jersey. He traced the growth of five small industries served by his company and used them as examples of how small industries expand and provide a market for the utility. He stressed that this demand comes not only from the industry itself but also from the employees who require service for their homes.

B. C. McCabe, president, National Tax



CONGRATULATIONS FOR NEW E.E.I. PRESIDENT—Grover C. Neff, president of Wisconsin Power & Light Co., Madison, receives congratulations on his election to the E.E.I. presidency from his predecessor, Charles W. Kellogg, left

WAITING FOR THE FIRST SESSION—Attendants at the E.E.I. convention form informal groups in the foyer to the grand ballroom before the opening session on Monday morning. Several latecomers can be seen registering at the desk in the foreground

Equality Association, told of the work of his association in making the nation conscious of the menace of the tax-exempt cooperatives. He said the co-op movement is still growing and that all co-ops did a business of $12,000,000,000 in volume in 1945.

Ralph L. Carr, former governor of Colorado, advocated the marketing of power from government dams through existing agencies whether they be privately owned, cooperatives, or municipal or other governmental bodies. He characterized the building of duplicating transmission lines by the government as waste and scoffed at claims that these lines are needed to protect the government from business-managed utilities, to protect the consumer from exorbitant rates, and to insure better living conditions in all areas.

•

Provo, Utah, and Utility Make Power Exchange Agreement

A five-year exchange power agreement put into effect last month between Utah Power & Light Co. and the city of Provo, Utah, provides that the city may take stand-by power up to a peak of 2,000 kw., with a minimum of 250,000 kw.-hr. at the rate of 2 cents per kw.-hr., amounting to $5,000 annually.

In return, the Provo plant will sell surplus power to the private utility at 5 mills per kw.-hr.

Electrical Show to Run with 1947 A.I.E.E. Meeting

An Electrical Engineering Exposition will be held concurrently with the winter convention of the American Institute of Electrical Engineers, January 27 to 31, 1947, in New York. Planned for 1941, postponed because of war conditions, the exposition is being revived with considerable support from electrical manufacturers.

The 71st Armory, Park Ave. and 34th St., will be used, and the International Exposition Co., Grand Central Palace, New York 17, N. Y., will manage the exposition.

•

Allis-Chalmers and Union Negotiating to End Strike

Representatives of Allis-Chalmers Manufacturing Co. and officials of United Automobile Workers (C.I.O.), Local 248, resumed negotiations Monday after a state board ordered the union to halt illegal picketing.

Announcement of the break in the deadlock between the union and the company was made Saturday by Maj. James P. Holmes, resident federal conciliator, following the state labor relations board's illegal picketing findings.

Walter Geist, president of the company, immediately informed Secretary of Labor Lewis B. Schwellenbach that Allis-Chalmers was ready to negotiate and requested that the department's conciliation service arrange the Monday meeting. Robert Buse, president of the union, announced that the union would appeal the ruling and that "in the meantime picketing will continue as usual."

Geist and W. C. Van Cleaf, director of industrial relations for the company, stated that the 6,000 office and supervisory employees who had been instructed to remain away from work to avert violence at the picket lines were told to report Monday morning.

•

Central Maine Refinancing Sets Record High for State

The largest refinancing program in Maine's history was completed recently by the Central Maine Power Co. A total of $45,000,000 was involved in the transaction which called for the issue of a new bond series and the partial retirement of existing bond series; the exchange of all except 6 percent old preferred stock for a new issue of preferred; and the sale of a new issue of common stock.

Of all outstanding preferred which was called for redemption, 54.5 percent was exchanged for shares of the new issue before the May 20 deadline. This exchange included cash in addition to new shares. The remaining shares will be redeemed for cash on July 1.

Symposia on Many Topics Held by P.E.A. Engineers

2 Schools of Thought on Allocation of the Maintenance Component of Incremental Generating Costs Heard—Lower Cost Carrier Relaying Discussed—Attendance Tops 250

SYMPOSIA on the maintenance component of increment energy interchanges, on low cost carrier relaying, on criteria for generation reserves, and on demand metering trends constituted the major deliberations at a group of joint meetings of the Engineering Section of the Pennsylvania Electric Association on May 28 and 29. Another lively theme was the overheating of connectors and clamps. The sessions were held in Harrisburg and over 250 were registered from Pennsylvania and other Eastern states.

Two schools of thought concerning the allocation of the maintenance component of incremental generating costs were aired at a joint meeting of the Systems Operation, Prime Movers, and Hydraulic committees. F. J. Light, Philadelphia Electric Co., represented the "constant" school, and M. J. Steinberg, Consolidated Edison Co., the "proportional" school. Light said that the increment cost is essentially a segregation of fuel and maintenance because other components are largely constant for a given plant. Analysis of test and accounting information resulted in a 0.16 mill maintenance cost for one station and 0.23 for another, both over full load range.

Steinberg established his proportionality procedure in an analysis of 1928-1943 costs and found that maintenance (including buildings and structures) averaged 24.2 percent of the fuel cost with fuel ranging from 13.5 to 21.5 cents per million Btu. On an incremental basis this amounts to practically 20 percent of the incremental fuel cost for the whole system.

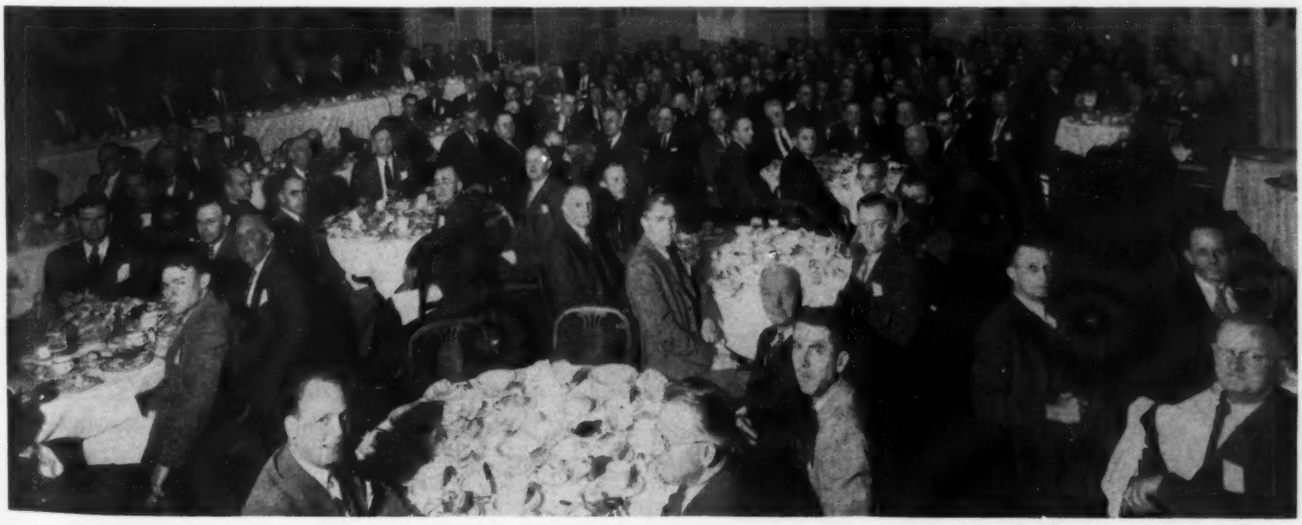
In the same joint session W. J. Lyman, Duquesne Light Co., and H. W. Phillips, supervisor Pa.-N. J. interconnection, emphasized the importance of both probability of large-scale outage and the load duration curve in juxtaposition to the risk management is willing to take when fixing the reserve percentage. Almost any company would probably be willing to risk the prospect of a 24 percent loss of capacity for as little as 0.01 percent of the time, said Lyman, but not for a substantially longer period of peak. He favored use of 1 percent as the ratio of generation outage to total outage from all other courses and suggested something like 4 percent reserves to provide for maintenance and about 6 percent for breakdowns on an interconnected system.

Phillips mentioned the narrowing spread between morning and evening peaks as pointing to larger reserves merely to provide for maintenance. He cautioned against the weakening of reserves that accompanies too extensive a resort to single boiler-turbine combinations. Other factors warranting difference in reserve ratios for different systems is the high-end steepness of the duration curve and the different errors in load forecasting due to effect of weather.

Lower cost carrier relaying was described by W. H. Lambert, Pennsylvania Electric Co., at a joint session of the Electrical Equipment and Communication Committees, and the manufacturers at the same sessions described the application of phase comparison relaying, the latter contributing to economy by obviating the need of expensive potential transformers. Lambert reported halving the terminal cost by simplification of the panel setup, by devising an inexpensive carrier choke, and by insulating the breaker bushings for use as coupling capacitor. K. N. Reardon, West Penn Power Co., mentioned the occasional deferment of expensive commercial carrier installations until multiple usage could be justified.

L. F. Kennedy, General Electric Co., suggested that P.E.A. could well initiate agreement among the utilities on a middle-ground course between the extremes of inadequate simplicity and of undesirable complexity, the latter for the sake of meeting unlikely contingencies. Harvey Sleeper, Public Service Electric & Gas Co., Newark, N. J., raised the matter of complexity incurred in providing for transferring any kind of relaying to the spare breaker. He also said it would be nice, with so many lines up for relaying, to know approximately what ultimate form of relaying would supersede the rapidly evolved philosophies now in vogue. Kennedy estimated that carrier terminals cost from 0.5 to 5 percent (average 2) of the over-all cost of 69-161 kv. lines from 5 to 100 miles long.

Five 3,000-kva. substations appear to be more logical and economical for serving a 30-sq. mi. residential area of Baltimore than expansion of two existing



DINNER—Members of the Engineering Section of the Pennsylvania Electric Association attend dinner at Harrisburg

substations to 15,000 kva. or adoption of a 4-kv. primary network. This was detailed in a paper by M. A. Polster, Consolidated Gas Electric Light & Power Co., which showed respective investment savings of 17 and 21 percent.

As density increases the substation cost rises in importance alike for network and radial, said O. B. Falls, General Electric, and the laterals in either case range from 70 to 90 percent of the total outlay for densities from 500 to 3,000 kva. per square mile. He added that too much stress is being given to complete bus regulation.

Oxidation Grows Above 70 C.

Oxidation within clamps and taps grows rapidly above 70 C., said Stanley Killian, Delta-Star Electric Co., in reporting tests on experimental finned connectors aimed at low temperature joints. G. E. Ewald, Public Service Electric & Gas, reported fault current tests (up to 15,000 amp. for 1 sec.) with no failure of any of twelve connectors when properly cleaned. He was inclined to be more dubious about automatic line splices than about tap connectors.

J. B. Clapp, Thomas & Betts Co., demonstrated the 20-ton, light-weight, modified Blackhawk hydraulic compressor which applies 20-ton psi. pressure to a hexagonally crimped line splice through a permanently oil-filled hose.

Infinite variety of aerial cable design is possible, said T. F. Peterson, American Steel & Wire Co., because of conflicting objectives of corrosion-prevention, impulse strength, heat dissipation, etc. He urged reconciliation of these divergences and concentration upon a limited number of designs.

Demand Metering

In the meter committee sessions the major issue was demand metering and the consensus, after a talk by W. M. Howe, General Electric, was that the desired standardization and evolution in the field of demand metering would best be done by the manufacturers.

At the dinner session of all groups President Francis McQuillin told the engineers of the association that they deserve cheers for their doggedness, competence, resourcefulness, vision and general contributions to human welfare but that "they don't blow their horns loud enough." Engineers, he said, were the largest of any professional group (21.6 percent) on division staffs in the war.

Howard S. Fitch, general superintendent of substations, West Penn Power Co., and former engineering chairman, urged retention of all factors of utility strengths, including obsolescent plants, to meet any potential emergency that may confront the United States at any time.

Teheran to Get Plant That Many Wanted and None Got

This is the story of an electric generating plant, originally built to power the Chinese war machine, which is finally being delivered, via diversions to Russia and Italy, to Teheran, capital of Iran.

When first built, it consisted of four 2,000-kw. full condensing steam turbines, complete with boilers, auxiliaries, switchgear, and even materials for the power plant building. The Japs cut the Burma Road and the unit could not be delivered to China; so it was decided to divert the equipment to Russia. Then China came back into the picture; so the diverted portions were reordered for China.

At this point came more diversions, again to Russia, and subsequent reorderings, a process whose details are lost in maze of existing and defunct government agencies which had something to do with it. At one point the plant, including what original portions there were left and reordered items, was turned over to the army for use in Italy. Some of the steel framework for the building actually arrived in Italy, but the generating equipment remained in this country, held up by the changing tides of war.

Came the end of the war and the problem of unloading what could be sold of the unneeded war equipment. Teheran, in need of power equipment but short on dollar exchange, somehow got wind of the existence of this equipment, and in due course, an arrangement was agreed to whereby the city could pay in dollars or exchange silver bullion. At the last minute, the barter deal fell through when Teheran learned that it could exchange bullion only at the rate of 71 cents per ounce, while the metal could be sold in the market for 90 cents.

As it stands today, the sale is to go through on a cash—not barter—basis, with Teheran paying $800,000 for the equipment which cost the government $997,000 and which today, with the recent 15 percent price increase, would cost about $1,115,000. One of the four turbo-generators was cannibalized by the army, leaving 6,000 kw. of generating capacity but auxiliaries, including boilers, for 8,000 kw. It is understood Teheran plans to order a fourth turbo-generator.

•

New Jersey Power Wins Annual Report Competition

New Jersey Power & Light Co., Dover, has been awarded first prize in the annual competition sponsored by Reddy Kilowatt Service for the electric light and power company producing the best annual report.

Honorable mention went to Kansas Gas & Electric Co., Northern States Power Co., and Pennsylvania Power & Light Co.

Objects of the competition are to encourage the clarification of annual reports, in order that the average stockholder can read and understand the year's business operation of a company. Among the chief requirements of the contest are that the report must be in simple language, must dramatize accomplishments, and build good will.

The judges were Merryle S. Rukeyser, economic analyst and financial writer; Col. H. S. Bennion, managing director, Edison Electric Institute; and Samuel B. Williams, editor of ELECTRICAL WORLD.

COORDINATORS GET ARMY AWARDS—Four engineers of the Consolidated Gas Electric Light & Power Co. of Baltimore receive awards for their contribution to the Utilities Wartime Aid Program. Left to right, A. H. Chandler, J. C. Tuttle, Maj. Gen. M. S. Eddy, commanding general 3rd Service Command, who presented the scrolls, W. D. Gentry, E. A. Stoner.

Emergency Anti-Strike Legislation Passed by Senate Adds to Power of Government

Upper Chamber Amends Measure as Passed Overwhelmingly by House to Eliminate Drafting Strikers and Seizure by the Government of Profits During Government Operation

EMERGENCY anti-strike legislation passed by the Senate, although not all that President Truman asked for, would give the government considerably more power than it now has under the Smith-Connally Act to deal with labor disputes or strikes affecting national health, security, economic structure, or effective transition from war to peace. The amended bill has been returned to the House for its approval.

This proposed law differs from the Case Bill in that it is intended for the reconversion emergency only and is applicable only after government seizure of the facilities involved. The Case Bill, as sent to Mr. Truman, was a permanent disputes control law. Regarding public utilities, it was intended to forestall strikes until certain procedures had been exhausted. It did not bar strikes. If a strike occurred, seizure could be invoked under the Smith-Connally law.

Senate Vote Is 61-20

The Senate, in adopting the emergency legislation by a 61-20 vote, made some important changes in the text presented to the House by Mr. Truman, which the House passed swiftly with only 13 dissenting votes. It eliminated the power to draft strikers and the turning of profits under government operation into the U. S. Treasury. It would also terminate the law on June 30, 1947, rather than six months after the cessation of hostilities, if June 30 is earlier.

A significant advantage over the Smith-Connally law is a provision, after the President has proclaimed a national emergency, requiring both employers and union leaders to take affirmative action to call off or terminate a strike or lockout. Penalty for failing to do so would be $5,000 fine or one-year imprisonment, or both. Injunctions would be permitted to obtain compliance. This would preclude situations comparable to the soft coal and railroad strikes, where there was no obligation on union leaders to end the strikes despite government operation.

The President would designate a period of at least 48 hours before a proclamation would take effect, during which time efforts would be made to have the operators and union leaders end any strike.

After seizure, the President would have the power to fix "fair and just" wages and other conditions of employment for the period of seizure. As a practical matter, employers would have to assume at least the same wage rates and working conditions, if they were acceptable to the workers, before they would regain control of their property.

Strikers who failed to return to work on or before the effective date of a presidential proclamation (or who later went on strike) would lose their rights as employees unless rehired "by the government or owners." This goes beyond the Smith-Connally Act which imposes no penalty whatever on individuals who refuse to work under government seizure.

The Case Bill, which would establish a federal mediation board to aid in the voluntary settlement of disputes, contains a special procedure for disputes "involving a public utility whose rates are fixed by some governmental agency." In addition to a 60-day cooling-off period provided for other disputes, the board could ask the President to create an emergency commission if it found that the utility dispute threatened "a substantial interruption of an essential monopolized service." The commission would have 30 days to make recommendations as to wages, hours and working conditions. These recommendations the President would make public. The cooling-off period would continue for another five days after the recommendations were submitted to the President.

There would be no obligation on either party to accept the recommendations, but seizure would probably occur unless there was a settlement of the dispute.

Other provisions of the Case Bill would (1) Provide criminal penalties for robbery or extortion which interferes with the movement of any articles in interstate commerce; (2) Prohibit employer payments to welfare funds administered solely by unions; (3) Exclude supervisory employees from Wagner Act protection unless they were in an occupation which was covered by union contract under custom prevailing before July 1, 1935; (4) Allow federal suits against unions for violation of contracts; and (5) Ban secondary boycotts.

•

Wisconsin Utilities Given Honors by Army and Navy

Army and Navy representatives, in a joint ceremony on May 24, in Milwaukee, presented public utility companies and their employees with scrolls for their outstanding services performed during World War II. The ceremonies were held in conjunction with the annual officers' installation dinner of the Wisconsin Utilities Association.

The Navy scrolls "for meritorious service and outstanding performance rendered beyond normal responsibility during World War II" were personally awarded by Commander C. D. Tarleton

WHEN UTILITIES WERE HONORED—For their aid to the armed services during the war, these Wisconsin utility executives were given certificates at the installation dinner of the Wisconsin Utilities Association on May 24, at Milwaukee. Left to right, Maj. Gen. Louis A. Craig and Commander C. D. Tarleton, who presented the awards; S. B. Sherman, Wisconsin Gas & Electric Co.; Theron Brown, Madison Gas & Electric Co.; Grover C. Neff, Wisconsin Power & Light Co.; W. E. Schubert, Wisconsin Michigan Power Co.; G. W. Van Derzee, Wisconsin Electric Power Co.; C. E. Kohlhepp, Wisconsin Public Service Corp.; Bruno Rahn, Milwaukee Gas Light Co.

HONORED BY ARMY—Utility men who received Army awards for their services as coordinators of the Utilities Wartime Aid Program at Milwaukee, May 24, left to right, G. K. Hickman, C. D. Brown, R. M. Bert, J. R. Thomson, E. A. Tyrakowski, L. J. Hau, R. A. Whitney, E. A. Menke, R. W. Noddins, and R. P. Smeby

to the following companies:

Madison Gas & Electric Co., Milwaukee Gas Light Co., Northern States Power Co., Wisconsin Electric Power Co., Wisconsin Gas & Electric Co., Wisconsin Michigan Power Co., Wisconsin Power & Light Co., Wisconsin Public Service Corp.

Major General Louis A. Craig, commanding general of the 6th Service Command, awarded Army certificates for its "appreciation of patriotic service in position of trust and responsibility" to 35 regional and post coordinators of utility companies in Wisconsin, Illinois, and Michigan.

Coordinators honored were:

T. A. Brown, Madison Gas & Electric Co.; A. L. Christensen, Northern States Power Co.; C. D. Brown, G. K. Hickman, Wisconsin Electric Power Co.

R. M. Bert, F. L. Fletcher, Central Illinois Electric & Gas Co.; C. W. Organ, J. H. Smelter, Robert Clark, Central Illinois Light Co.; A. J. Borchers, E. D. Hartzell, W. G. Copeland, Central Illinois Public Service Co.; R. P. Smeby, L. J. Hau, E. A. Tyrakowski, Commonwealth Edison Co.; F. H. Collins, R. B. Smith, F. T. Mitchell, W. H. Hager, W. D. Peel, Illinois Power Co.

R. J. Benson, Produce Terminal Corp.; R. A. Whitney, E. A. Menke, R. W. Noddins, Public Service Co. of Northern Illinois; G. F. Ileff, Springfield Water, Light & Power Department.

H. O. Jenson, Alpena Power Co.; A. E. Kriegsman, C. A. Mulligan, J. R. Thomson, Consumers Power Co.; George M. Allen, George R. Catlin, L. J. Van Tuyl, Detroit Edison Co.; Thomas Candler, Edison Sault Electric Co.

Because of the railroad strike not all of the coordinators were able to be present for the ceremonies. Their certificates have been forwarded to them.

Electric Energy Production Drops in March-April

Electric energy produced for public use in April, 1946, totaled 17,480,827,000 kw.-hr., a decrease of 6.2 percent when compared with April, 1945, public use production, while combined production of utilities and industrial establishments of the country was 21,271,203,000 kw.-hr. during the same period, a decrease of 6.8 percent from April of last year, according to the report issued by the Federal Power Commission.

Electric energy produced for public use in March, 1946, totaled 17,788,389,000 kw.-hr., a decrease of 8.9 percent when compared with March, 1945, public use production, while combined production of utilities and industrial establishments was 21,657,070,000 kw.-hr. during the same period, a decrease of 9.5 percent from March of last year.

•

40-Hour Week Established

A five-day, 40-hour week became effective for employees of the Lower Colorado River Authority on June 1. Employees of the state agency, which operates four hydro plants in Central Texas, have been working 5½ days, 42 hours a week. Time and one-half will be paid for overtime.

On May 1, a retirement system for all employees of more than five years' continuous service and a hospital-surgical insurance plan for those employed as long as three months were established.

MEETINGS

Previously Listed

REA Co-op Managers of Georgia—DeSoto Hotel, Savannah, Ga., June 10-11. M. H. Mulkey, Jr., Middle Georgia Electric Membership Corp., Vienna, Ga.

Pacific Coast Electrical Association — Annual convention, Fairmont Hotel, San Francisco, Calif., June 12-14. V. W. Hartley, managing director, 447 Sutter St., San Francisco 8, Calif.

National Electrical Manufacturers Association—Special sections meetings, The Homestead, Hot Springs, Va., June 17-19. W. J. Donald, managing director, 155 E. 44th St., New York 17, N. Y.

American Society of Mechanical Engineers—Semi-annual meeting, Book Cadillac and Statler hotels, Detroit, Mich., June 17-20; fall meeting, Statler Hotel, Boston, Mass., September 30-October 2. Ernest Hartford, executive assistant secretary, 29 W. 39th St., New York 18, N. Y.

American Society of Agricultural Engineers — Annual meeting, New Jefferson Hotel, St. Louis, Mo., June 24-26. Raymond Olney, secretary, St. Joseph, Mich.

American Institute of Electrical Engineers—Summer convention, Hotel Statler, Detroit, Mich., June 24-28. H. H. Henline, secretary, 33 W. 39th St., New York 18, N. Y.

American Society for Testing Materials — Annual meeting, Buffalo, N. Y., June 24-28. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia 2, Pa.

Canadian Electrical Association — Annual meeting, Banff Springs Hotel, Banff, Alberta, Canada, June 26-28. B. C. Fairchild, managing director, 704 Tramways Bldg., Montreal 1, Que., Canada.

Rocky Mountain Electrical League—Annual convention, Estes Park, Colo., September 5-7. R. B. Hubbard, manager, Gas & Electric Bldg., Denver 2, Colo.

Instrument Society of America — National Instrumentation Conference and Exhibit, Wm. Penn Hotel, Pittsburgh, Pa., September 16-20. Richard Rimbach, executive secretary, 1117 Wolfendale St., Pittsburgh 12, Pa.

Illuminating Engineering Society — National convention, Chateau Frontenac, Quebec, September 18-21. A. D. Hinckley, executive secretary, 51 Madison Ave., New York 10, N. Y.

Municipal Electric Utilities Association of New York State—Annual conference, Mark Twain Hotel, Elmira, N. Y., September 25-27. T. J. McKee, secretary, 200-212 E. Third St., Jamestown, N. Y.

Increase in Price of Cable Will Average 18½ Percent

An average increase of 18½ percent in the list price of wire and cable is expected to result from the Office of Price Administration's recent ruling which elevated the copper price 2⅜ cents to a new ceiling of 14⅜ cents and the price of lead 1¾ cents to a new high of 8¼ cents. The ruling, which is so worded that only the additional costs of the materials involved can be passed on to the user, makes it necessary to figure the rise for each type of cable for each voltage rating for each size. This computation makes it difficult to arrive at any percentage figures.

However, the best estimates available from the manufacturers brought forth these averages which are stated to be "rough and approximate." The over-all average is expected to rise 18½ percent. Special types of cable are expected to approximate the 18½ figure, insulated conductors 18, bare conductors 11 to 12, and magnet wire 17½ percent. Building wire had an optional increase of 10 percent plus the materials cost rise of 18 percent, and Romex type 15 percent optional plus the 18 percent.

Armored cable was excluded from the order because a survey is now being conducted which will result in a new dollar-and-cent ceiling being fixed for this product which will reflect all added cost elements. Cord sets, battery cable, wiring harnesses, and ignition sets were not covered by the order since OPA states the added material costs will not significantly affect production costs.

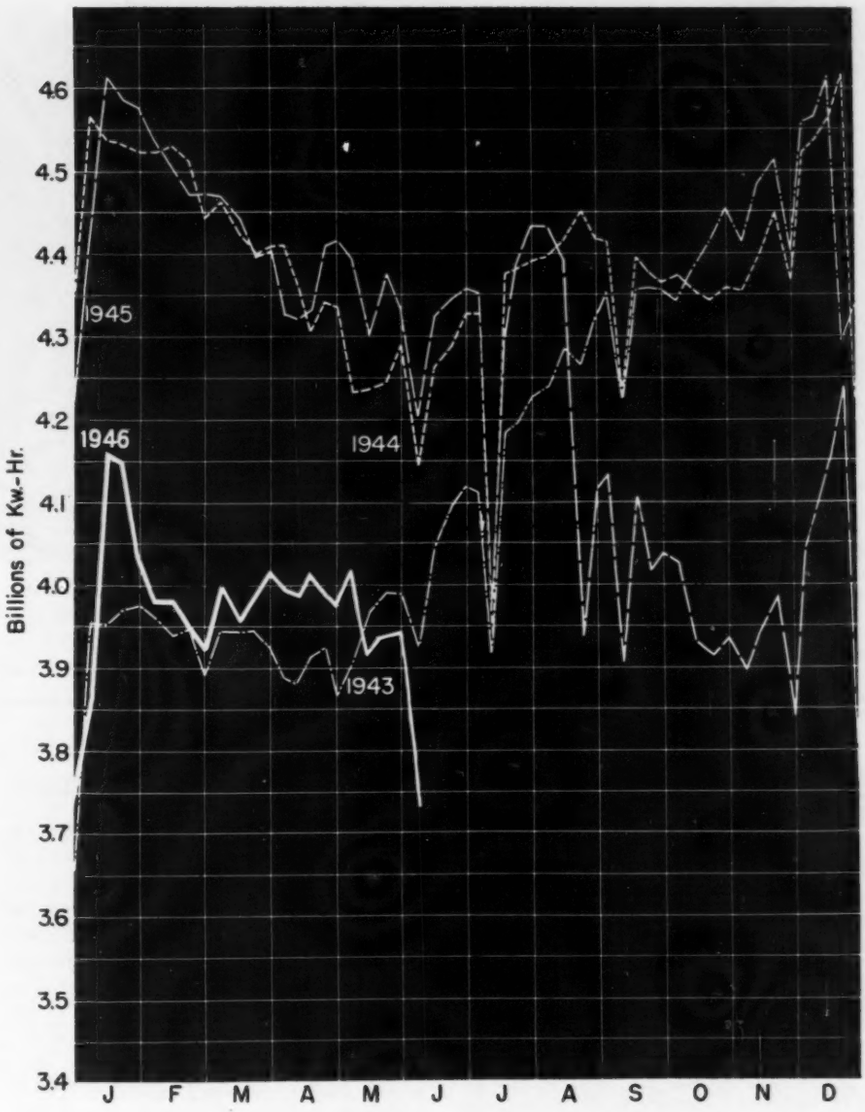
•

Pacific Gas & Electric Co. Will Buy Tuolumne System

Pacific Gas & Electric Co. will purchase the electric distribution system in Tuolumne, Calif., from the Turnback Creek Light & Power Co., subject to approval of the California Railroad Commission.

The Turnback Creek Co., wholly owned subsidiary of the West Side Lumber Co., which has provided Tuolumne with lighting service since 1900, operates a steam-electric generating plant and supplements the supply with power purchased from P. G. & E. The Tuolumne system now serves electricity to 471 residents.

Company spokesmen indicated that customers' bills, under P. G. & E. rates, will be approximately 10 percent less than they now pay, and that service will be made available to outlying districts not now connected, pending availability of materials and manpower.



Electric Output Curve Drops Sharply

The electric output curve dropped sharply during the week ended June 1, 1946, which contained the Decoration Day holiday, reaching the lowest point since the close of December, 1942. Edison Electric Institute reports the amount of electrical energy distributed by the light and power industry at 3,741,256,000 kw.-hr., compared with 3,941,865,000 kw.-hr. during the preceding week. During the week ended June 2, 1945, the amount of electrical energy distributed amounted to 4,203,502,000 kw.-hr., this year's figure representing a decrease of 11.0 percent.

All of the seven major geographical regions of the country reported losses for the week ended June 1 as compared with the corresponding week of last year with the exception of the Rocky Mountain states, which remained in the plus column with an increase of 12.9 percent. The largest decrease was reported by the Central Industrial and the Southern groups, both of which showed a loss of 15.1 percent. The Pacific Coast reported the second highest drop—10.4 percent.

Weekly Output, Millions Kw.-Hr.

1946		1945		1944	
June 1	3,741	June 2	4,204	June 3	4,144
May 25	3,942	May 26	4,330	May 27	4,292
May 18	3,939	May 19	4,377	May 20	4,246
May 11	3,911	May 12	4,302	May 13	4,238
May 4	4,012	May 5	4,397	May 6	4,234
Apr. 27	3,977	Apr. 28	4,416	Apr. 29	4,336
Apr. 30	3,987	Apr. 21	4,411	Apr. 22	4,344
Apr. 13	4,015	Apr. 14	4,332	Apr. 15	4,307
Apr. 6	3,988	Apr. 7	4,322	Apr. 8	4,361
Mar. 30	3,992	Mar. 31	4,329	Apr. 1	4,409
Mar. 23	4,017	Mar. 24	4,402	Mar. 25	4,409
Mar. 16	3,988	Mar. 17	4,398	Mar. 18	4,400

Percent Change from Previous Year

	Week Ending		
	June 1	May 25	May 18
New England	— 3.3	— 1.5	— 1.6
Mid-Atlantic	— 5.0	— 5.2	— 3.7
Central Industrial	—15.1	—12.0	—14.4
West Central	— 9.4	— 2.0	— 3.6
Southern States	—15.1	—12.1	—13.4
Rocky Mountain	+12.9	+ 7.3	— 2.5
Pacific Coast	—10.4	— 9.8	— 8.7
Total United States	—11.0	— 9.0	—10.0

SEC RULINGS

The Securities and Exchange Commission recently issued a series of orders affecting electric utility companies.

DAYTON POWER & LIGHT CO. and COLUMBIA GAS & ELECTRIC CORP.'s joint proposal, covering the issuance by Dayton to Columbia of 1,530,000 shares of Dayton's reclassified common stock, $7 par value, in return for the surrender for cancellation of 360,000 shares of Dayton's outstanding no par value common stock, has been approved. Columbia Gas is the parent company of Dayton Power. The commission also approved the proposed sale under competitive bidding conditions by Columbia of the 1,530,000 shares of Dayton common, reserving jurisdiction, however, over the results of such bidding, the underwriters' spread and all legal fees and other expenses. The agency's order of approval also covered Columbia's proposal to use the proceeds from the sale of the new Dayton common to redeem its own 5 percent debentures, now outstanding in the principal amount of $44,914,000 and, to the extent available, to prepay its 1½ percent bank notes, outstanding in the principal amount of $22,000,000. (Release No. 6656).

STANDARD GAS & ELECTRIC CO.'s proposed sale and transfer of 177,000 shares of common stock, par value $25 per share, of Pacific Gas & Electric Co. is in accordance with the order of the commission dated August 8, 1941, SEC has ruled. The order found that the divestment by Standard Gas & Electric Co. of its interest in Pacific Gas & Electric Co. was necessary and appropriate for the purpose of bringing about compliance by Standard Gas & Electric Co. with Section 11 (b) (1) of the Public Utility Holding Company Act. (Release No. 6608).

JERSEY CENTRAL POWER & LIGHT CO.'s proposed refunding program, reserving jurisdiction over the results of competitive bidding for new securities to be issued, has been approved. Joining in the application for approval were NY PA NJ Utilities Co. and General Public Utilities Corp., direct and indirect parents, respectively, of Jersey Central. Included in the program is the donation by General to NY PA NJ of $4,200,000 as a cash contribution to the latter's capital and a donation by NY PA NJ to Jersey Central of $5,000,000 in cash as a contribution to the subsidiary's capital. Jersey Central will issue and sell competitively $34,500,000 face amount of new thirty-year first mortgage bonds and 125,000 cumulative preferred shares, $100 par value, and borrow $7,000,000 on unsecured 1¾ percent ten-year serial notes. Proceeds, the $5,000,000 contribution from NY PA NJ and such treasury funds as are necessary, will be used to redeem all Jersey Central's outstanding bonds, promissory notes and three series of preferred at an aggregate cost of $65,151,097. (Release No. 6637).

•

Uniform Accounts Planned

The Louisiana Public Service Commission has notified twelve electric companies that it proposes to prescribe a uniform system of accounts for such utilities in the state.

AWARDS FOR UNION ELECTRIC—Meritorious wartime service awards are presented by Rear Adm. William H. Smith and Maj. Gen. William G. Livesay to J. W. McAfee, president of Union Electric Co. of Missouri; Vice-President Ralph E. Moody; and Development Engineer Ernst A. Freund

Northern States Will Add Steam Capacity at 5 Places

A $7,000,000 expansion program that contemplates the construction of two new generating stations and additions to the capacity of three generating stations, as well as the completion of an 80-mile transmission interconnection on the system of the Northern States Power Co., was announced recently by officers of the company, at Minneapolis.

The two new generating stations, each of 10,000-kw. nominal capacity, are to be substantially identical single-unit, single-boiler coal burning plants. In both instances a 125,000-lb. per hr. boiler will deliver steam to the turbine throttle at 650 psi., 825 deg. The generators are rated 10,000 kw. 0.7 pf. One of the two new plants is to be installed within four miles of Sioux Falls, S. D. The other is to be located at an as yet undisclosed point in southern Minnesota.

The company also will install 10,000 kw. of additional generating capacity at its Whitney plant at St. Cloud, Minn. This turbo-generator addition will operate on steam at 450 psi., 750 deg. and will include a 125,000-lb. per hr. boiler. The new unit will bring capacity to the Whitney plant to 17,500 kw.

A fourth addition to system generating capacity will be made at the company's French Island station, LaCrosse, Wis. It will consist of a 10,000-kw. turbo-generator unit and 125,000-lb. per hr. boiler operating on steam at 450 psi., 750 deg. and will bring capacity of this station to 20,000 kw.

Also contemplated, according to the announcement, is an 80-mile, 79-kv. transmission interconnection between Fargo and Grand Forks, N. D. This project is expected to be completed in 1947.

Currently under consideration is the installation of 5,000 kw. of generating equipment at either Fargo or Grand Forks, N. D. However, the decision has not been made as to exact location of this installation.

Present plans call for all five extensions to generating capacity to be completed during 1947, it was disclosed. Upon completion of the program, these additions will bring the interconnected system capacity of the Northern States Power Co. close to 600,000 kw., it was stated.

UTILITY REPORTS

	Net Income 1946	1945
*Birmingham Electric	$1,135,831	$1,632,236
†Central Arizona Light & Power	1,030,674	762,747
†Dallas Power & Light	1,614,097	1,469,325
*Kansas City Power & Light	3,554,767	3,010,717
*Louisville Gas & Electric and subs	3,229,921	2,706,697
*Metropolitan Edison	4,155,296	3,921,634
*Virginia Electric & Power	5,932,953	6,350,558
†Washington Water Power	3,509,563	2,402,262
*Wisconsin Electric Power and subs	4,766,987	4,228,694

*Twelve months ended March 31.
†Twelve months ended April 30.

•

Indiana City Closes Plant

Greenfield, Ind., will abandon its municipal power plant except for emergencies and has signed a ten-year contract with the Public Service Co. of Indiana.

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

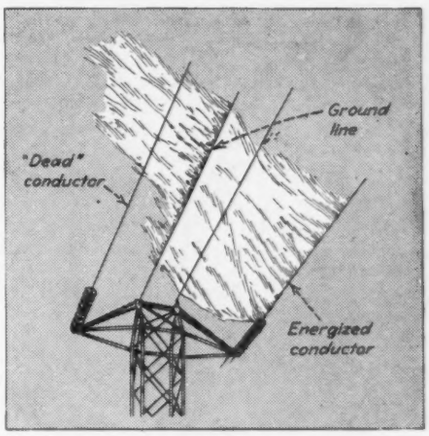
Man-Made Fault Checks Oscillograms

A RECENT TEST made by engineers of the Central New York Power Corp. involved an intentional fault on a 110-kv. power line to verify an unusual oscillograph pattern.

The transmission line on which the test was made is part of the Niagara Hudson System and has two 110,000-volt circuits between the Browns Falls hydro plant on the Oswegatchie River and the Colton hydro plant on the Racquette River, near Potsdam, N. Y. These circuits average nine cases of trouble per year, mostly due to lightning. Each fault is recorded by automatic oscillograph, and a detailed analysis is made of each oscillogram.

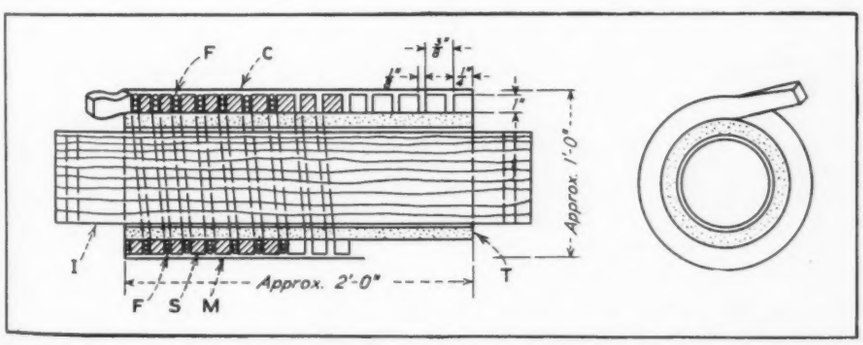
Recently, during a high wind storm, three oscillograms were recorded that did not follow the pattern usually typical of faults on these circuits. From their analysis of the oscillograms, relay department engineers surmised that the only thing which could have happened was that one of the circuits remained alive and arced to ground, from a small hydro plant connected with it, and that the arc blew into and faulted the second circuit.

The engineers decided to set up this assumed set of conditions. An arc was established at the Higley power house by stretching a 5-amp. fuse wire approximately 9 ft. from the top conductor to one overhead ground wire. Both circuits were disconnected from the balance of the system and then one circuit was energized from the Higley power house. As predicted by the oscillograms, an arc was established and maintained for 8½ seconds and finally blew itself out. The illustration indicates the area traveled by the arc (left to right 16 ft., at times to 31 ft. high) during 5.86 seconds while approximately 20 amp. of current were flowing at 110,000 volts to ground.



INTENTIONAL FAULT from one phase to ground, produced arc and proves oscillogram prediction

• • •



PRIMARY COIL for induction furnace. . . I—Magnetic laminated iron core. . . T—ceramic tube. . . C—conductor turns. . . F—Fiberglas cordage. . . S—coating of sodium silicate. . . M—layer of ceramic mud

Furnace Production Aided by Fiberglas

VIRTUAL ELIMINATION of production losses resulting from failure of induction furnaces employed for the melting of copper in the manufacture of shell cases at the U. S. Naval Gun Factory in Washington, D. C., has been attributed to a suggestion submitted by an employee of the factory.

Four induction furnaces were used at the factory. Work records reveal that on the average of once a month, one primary coil would burn out. Mica flakes used to insulate the ⅛-in. space between conductors would powder out under vibration and other service conditions. Spalling-off of the ceramic mud over the coil assembly would result in loss of the mica flakes.

This condition created a short between the conductors and took the furnace out of production. Because the furnace cooled immediately, the ceramic lining in the furnace proper was damaged, and it was necessary to reline the entire furnace. Furnace relining cost $3,500 per year, aside from the production loss incurred. Experimental use of several types of inorganic tapes and cords in an effort to prevent coil failure proved unsatisfactory under service conditions of 1,500 deg. F., attained in the primary coils.

Upon the suggestion of John L. Talbert, a civilian machinist employed in the gun factory, Fiberglas cord EC5-8 was used in the spacing between conductors. Twelve turns of the ⅛-in. untreated cord were applied by high spiralling between the conductors. Sodium silicate, which is resistant to high temperatures, was applied over the cord and allowed to dry. The assembly was sheathed with ceramic mud. A

cross section of the coil is illustrated on preceding page.

Coils insulated with Fiberglas cord have been in operation as long as 18 months without failure. According to the report of the Navy's Materials Division Office, the repaired coils have held up under a 75 percent overload furnace schedule. The report further states that recently the furnaces were converted from 220-volt to 440-volt operations, and the repaired coils were found to be in excellent condition after months of continuous use.

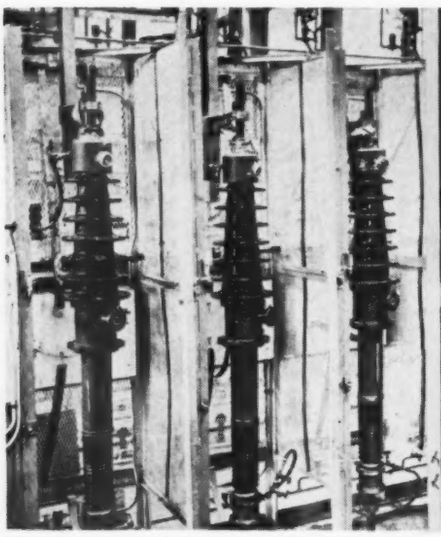
Since the merit of the suggestion has been established, all furnace coils have been rebuilt, including all spares in storage.

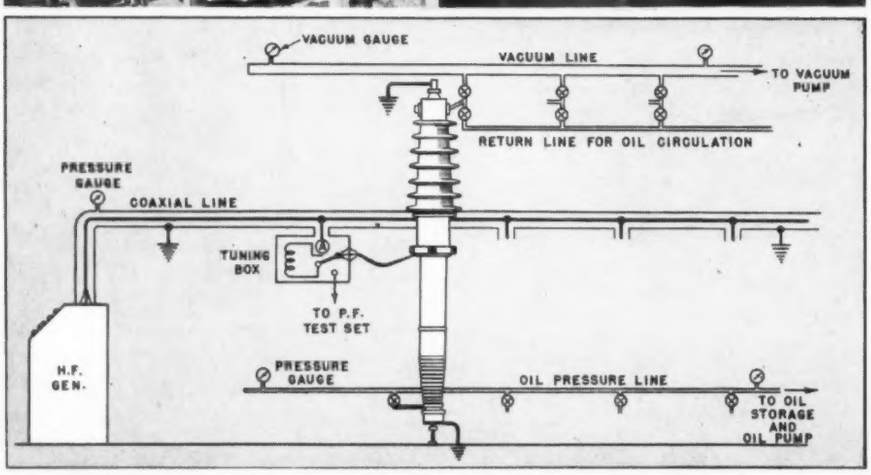
• • •

Dielectric Heating Dries Transformer Bushings

H. L. COLE

Section Engineer, Transformer Division
Westinghouse Electric Corp., Sharon, Pa.





DIELECTRIC HEATING of condenser type transformer bushings

(Top right) One of the standard 10-kw., 5-mc. generators which supplies a high-frequency current to a single rack of bushings. Coaxial transmission line is piped from top of generator through the row of cells. Box above operator contains disconnecting and transfer switches for operating more than one rack from a single generator. Small pipe connected to coaxial line supplies nitrogen and gage records nitrogen pressure

(Top left) Three of a row of five 115-kv. type O bushings for processing; cell doors open. High-frequency voltage is applied at the center flange of the bushing; vacuum line is connected at the top; oil line at the bottom. Temperature rise is measured by thermocouple or thermometer in center of bushing conductor tube

(Bottom) Schematic diagram of the main elements. High-frequency current supplied by the electronic generator at the extreme left is carried by nitrogen filled coaxial line to the tuning box where individual adjustments for each bushing are made. Moisture driven out of bushing by heat is carried off through vacuum line. Oil pressure line permits insulating oil to be forced into insulation while heat is still being applied after it has been thoroughly dried

DIELECTRIC HEATING has reduced the drying time of high-voltage condenser type transformer bushings by eight to ten hours. In this application of high-frequency heating the last trace of moisture in the bushing is driven off by heat generated directly within the insulation. The time formerly lost in bringing the bushing up to drying temperature has been saved as the entire insulation reaches the proper temperature within a short time after the power is turned on. In addition to the time saving, the bulky drying ovens or the network of steam piping previously required to apply heat to the bushing have been eliminated.

Completely assembled bushings are placed in the treating racks for heating. Racks are screened for safety, and to eliminate radio interference. The bushing is first heated, then evacuated, after which a power factor measurement is made to determine the dryness. When the power factor reaches a low limit. hot oil is admitted under vacuum. In the final process a pressure of 15 to 20 psi. is applied to complete the impregnation. Capacity measurements before and after filling with oil indicate the progress and completion of the process. Dielectric heating continues during the oil treatment.

Two standard 10-kw., 5-mc. generators supply the power to the bushings mounted in treating racks. The current to each bushing is adjusted under load by means of an ingenious tuning box provided for each bushing station. A temperature rise of 1 deg. C. per minute is obtained with an input of 1 kw. on a 115-kv. bushing. Under these conditions the high-frequency current is approximately 25 amp.

Less time in processing is one of the main advantages of dielectric heating. Another feature is that all the heat is

generated within the insulation, where it is needed. Elimination of steam heat, or hot air circulating around the bushing while oil and vacuum connections are being made and measurements taken contribute to good workmanship and quality control. The dielectric heating process has been in successful operation for the past ten months, during which time several hundred of the new oil impregnated condenser bushings have been produced.

• • •

Four-Place Checker For Demand Registers

B. J. BORTELL
Assistant Superintendent, Meter Dept.
Central Illinois Light Co., Peoria, Ill.

DEMAND REGISTERS formerly checked for accuracy directly on the meter by comparison with a rotating standard, in the conventional manner, are now being tested four at a time on a small gang-type checking device built in the Peoria meter shop of Central Illinois Light Co.

Essentially the device consists of a 240-rpm. synchronous motor, the speed of which is stepped down through a pinion and gear to give 60 rpm. at two positions and 36 rpm. at the remaining two. These speeds give about 70 percent load deflection on the two types of Sangamo meters used on the system. Voltages of 115, 230 and 460 are available for the timing motor at each register position of the device to correspond to voltages encountered in the field.

The principal 240-rpm. synchronous motor is mounted in an old meter socket which lies open side down to form the base of the checker. Shaft of the motor extends vertically through the back of the socket. Two pinions mounted several inches apart on the shaft each drive two gears. These gears are mounted on the disk shafts of two standard meter grids mounted back to back on a plywood frame that also supports the motor shaft.

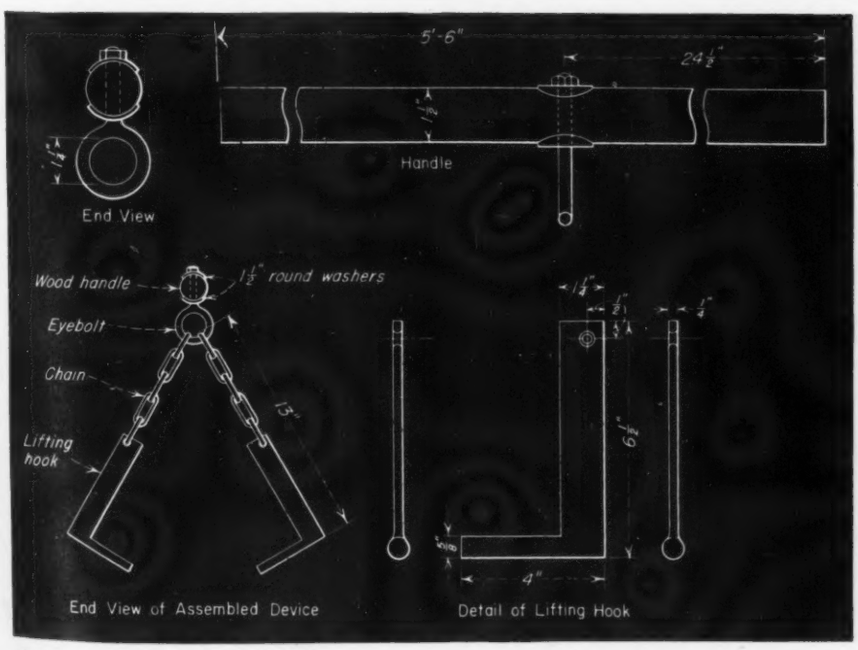
For convenience in verifying the synchronous speed of the motor a neon light is mounted in the base with the motor and serves as a stroboscope. A mirror mounted opposite a conduit opening in the base permits easy inspection of rotor markings under the stroboscopic illumination of the neon lamp.

A notched terminal strip, provided on the connection cord of the device, insures connection of the checker to test studs on the test board in proper manner.

CHECKING DEVICE verifies accuracy of four demand meter registers at once. Registers are mounted in meter grids mounted back to back. Register mechanism is driven from gear and pinion on vertical shaft turned by synchronous motor in base

• • •

Lifting Device Fits All Manhole Covers



DESIGN DETAILS of manhole cover lifter used by Indiana utility

THE "FROGGIE" universal manhole cover lifter, illustrated, was developed for Public Service Co. of Indiana, Inc., by Floyd Runkle, a foreman of the company's Lafayette division.

This lifter has the advantage that it can be operated by one man and can be used on any manhole cover regardless of the spacing between lifting holes in the cover. Two "L"-shaped lifting hooks that engage the holes in the manhole cover are individually chained to an eye bolt in the 5-ft. 6-in. handle 24½ in. from one end.

Used as a simple lever with one end of the handle resting on the ground outside the manhole ring, the mechanical advantage of the device is nearly 2¾ to 1. Horizontal component of the tension in the hook chains under load prevents the lifting hooks from disengaging during a lift.

Total Emissivities of Oxidized and Unoxidized Surfaces

THOMAS R. HARRISON, Technical Adviser, The Brown Instrument Co., Philadelphia, Pa.
(A Division of Minneapolis-Honeywell Regulator Co.)

WHEN A RADIATION PYROMETER is used to measure the temperature of a heated object not surrounded by walls heated to the same temperature, usually a correction should be applied depending upon the total emissivity of the surface of the object. Tables of total emissivities of oxidized and unoxidized substances often involved in industrial measurements are presented below for ready reference.

Principles involved in the application of total emissivity corrections under various conditions, and comparisons with optical pyrometer readings are discussed elsewhere.*

Total emissivity is defined as the ratio of the rate at which radiant energy of all wavelengths is emitted from unit area of a given substance to the rate at which radiant energy of all wavelengths is emitted from unit area of a blackbody at the same temperature. This ratio is indicated by e_t.

For a blackbody $e_t = 1$.

A blackbody is a radiator which, at any specified temperature, emits radiant energy at each wavelength of the maximum rate possible for any radiator as a result of temperature alone.

The following tables were prepared by William F. Roeser and H. T. Wensel of the Pyrometry Section of the National Bureau of Standards and are taken from the appendix of the treatise on "Temperature, Its Measurement and Control in Science and Industry" (American Institute of Physics, 1941), Reinhold Publishing Co., New York.

*See "Journal of the Optical Society of America" Vol. 35, pages 706 and 708, November, 1945, and "Instrumentation," Vol. 1, page 7, July and August, 1945.

Total Emissivities of Miscellaneous Materials (Most Values Are Uncertain by 10% to 30%)

MATERIAL	TEMPERATURE, DEG. C.	EMISSIVITY, e_t
Aluminum (oxidized)	200	0.11
	600	0.19
Brass (oxidized)	200	0.61
	600	0.59
Calorized copper	100	0.26
	500	0.26
Calorized copper (oxidized)	200	0.18
	600	0.19
Calorized steel (oxidized)	200	0.52
	600	0.57
Cast iron (strongly oxidized)	40	0.95
	250	0.95
Cast iron (oxidized)	200	0.64
	600	0.78
Copper (oxidized)	200	0.6
	1,000	0.6
Fire brick	1,000	0.75
Gold enamel	100	0.37
Iron (oxidized)	100	0.74
	500	0.84
	1,200	0.89
Iron (rusted)	25	0.65
Lead (oxidized)	200	0.63
Monel (oxidized)	200	0.43
	600	0.43
Nickel (oxidized)	200	0.37
	1,200	0.85
Silica brick	1,000	0.80
	1,100	0.85
Steel (oxidized)	25	0.80
	200	0.79
	600	0.79
Steel plate (rough)	40	0.94
	400	0.97
Wrought iron (dull oxidized)	25	0.94
	350	0.94
20 Ni-25 Cr-55 Fe (oxidized)	200	0.90
	500	0.97
60 Ni-12 Cr-28 Fe (oxidized)	270	0.89
	560	0.82
80 Ni-20 Cr (oxidized)	100	0.87
	600	0.87
	1,300	0.89

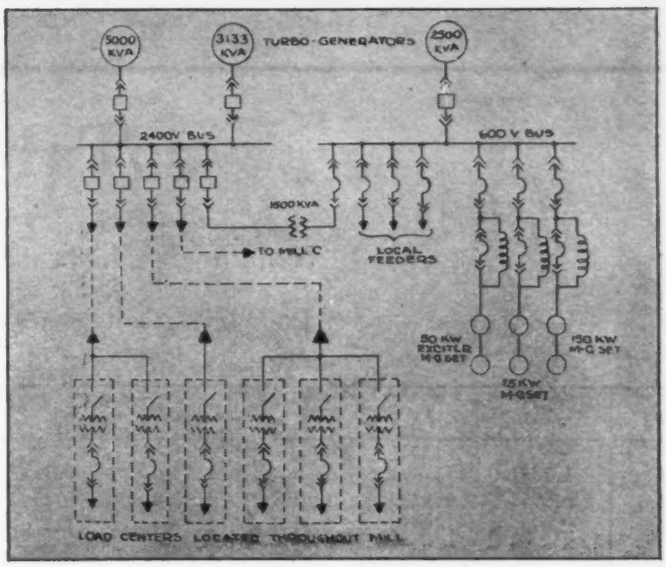
Total Emissivities of Metals, Surface Unoxidized

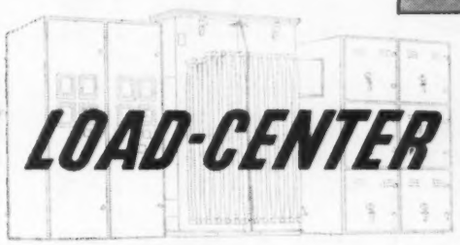
MATERIAL	EMISSIVITY, e_t AT TEMPERATURE, DEG. C.					
	25	100	500	1,000	1,500	2,000
Aluminum	0.022	0.028	0.060	....	....	....
Bismuth	0.048	0.061	....	....	....	....
Carbon	0.81	0.81	0.79	....	....	....
Chromium	....	0.08	....	....	....	....
Cobalt	....	....	0.13	0.23	....	....
Columbium	....	....	....	....	0.19	0.24
Copper	....	0.02	....	0.15†	....	....
Gold	....	0.02	0.03	....	....	....
Iron	....	0.05	....	....	....	....
Lead	....	0.05	....	....	....	....
Mercury	0.10	0.12	....	....	....	....
Molybdenum	....	....	....	0.13	0.19	0.24
Nickel	0.045	0.06	0.12	0.19	....	....
Platinum	0.037	0.047	0.096	0.152	0.191	....
Silver	....	0.02	0.035	....	....	....
Tantalum	....	....	....	....	0.21	0.26
Tin	0.043	0.05	....	....	....	....
Tungsten	0.024	0.032	0.071	0.15	0.23	0.28
Zinc	0.05*	....	....	....	....	....
Brass	0.035	0.035	....	....	....	....
Cast Iron	....	0.21	....	0.29†	0.29†	....
Steel	....	0.08	....	0.28†	0.28†	....

* At 300 deg. C.
† Liquid

Switchgear and Load-center Unit Substations are Shown in this One-line Diagram.

Originally, the 5000-kva generator was wound for 600 volts, and all but one circuit (to mill C) was powered from the 600-volt bus. The change to 2400-volt distribution brings short-circuit amperes to a value consistent with moderate-sized circuit breakers.





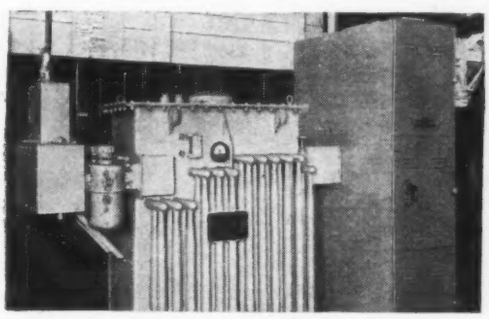
...BY G-E LOAD-CENTER UNIT SUBSTATIONS

● An old, inadequate plant power system was an open invitation to trouble at this mill. Electrical outages were delaying production. Circuits and switchgear which had been added piecemeal added to the danger of inadequate interrupting capacity. In spite of large secondary feeders, the distribution of 10,000 kva at 600 volts had created unsatisfactory voltage conditions.

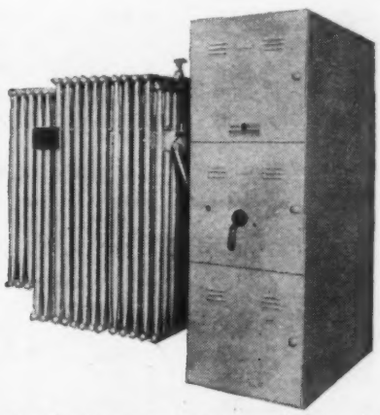
Analysis showed that further patchwork would be a costly practice. A new power distribution system, based on the use of G-E unit substations, was planned with the help of G-E engineers.

Now primary distribution is made at 2400 volts over cable that keeps voltage drop down, though it's modest in size. The powerhouse switchgear is all G-E metal-clad, equipped with magne-blast oil-less air circuit breakers. At load-center locations throughout the plant, six unit substations are installed, to step down from 2400 volts to 600. Individual circuits are fully protected by convenient metal-enclosed drawout air circuit breakers that are an integral part of the unit substation.

This new protection against outages and obsolescence is already justifying itself in power continuity and lowered costs. Why not determine, without obligation, if power-system replacement could do as much for you? Just call your local G-E representative. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



Typical load-center unit substation, as installed at locations which permit short low-voltage feeders to points of power use.



Another load-center unit installed in the mill, stepping 500-kva down from 2400 volts to 600. Draw-out air circuit breakers are co-ordinated with substation size to give full short-circuit protection without excess breaker size. Substation transformers use Pyranol non-inflammable insulating liquid.

LOAD-CENTER POWER DISTRIBUTION UNITS

Table of Multiples of

$N \times \sqrt{3} = N \times 1.732\ 050\ 807\ 568\ 877+$

In this table use N x 1.73205

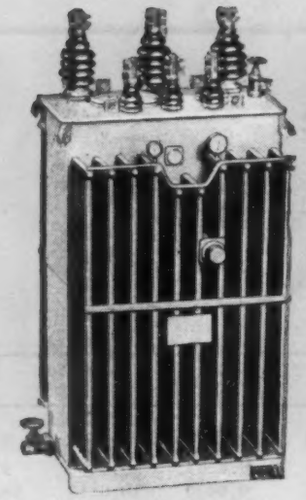
N	0	1	2	3	4	5	6	7	8	9
1.0	1.7321	1.7494	1.7667	1.7840	1.8013	1.8187	1.8360	1.8533	1.8706	1.8879
1.1	1.9053	1.9226	1.9399	1.9572	1.9745	1.9919	2.009	2.0265	2.0438	2.0611
1.2	2.0785	2.0958	2.1131	2.1304	2.1477	2.1651	2.1824	2.1997	2.2170	2.2343
1.3	2.2517	2.2690	2.2863	2.3036	2.3209	2.3383	2.3556	2.3729	2.3902	2.4076
1.4	2.4249	2.4422	2.4595	2.4768	2.4942	2.5115	2.5288	2.5461	2.5634	2.5808
1.5	2.5981	2.6154	2.6327	2.6500	2.6674	2.6847	2.7020	2.7193	2.7366	2.7540
1.6	2.7713	2.7886	2.8059	2.8232	2.8406	2.8579	2.8752	2.8925	2.9098	2.9270
1.7	2.9445	2.9618	2.9791	2.9964	3.0138	3.0311	3.0484	3.0657	3.0830	3.1004
1.8	3.1177	3.1350	3.1523	3.1697	3.1870	3.2043	3.2216	3.2389	3.2563	3.2736
1.9	3.2909	3.3082	3.3255	3.3429	3.3602	3.3775	3.3948	3.4121	3.4295	3.4468
2.0	3.4641	3.4814	3.4987	3.5161	3.5334	3.5507	3.5680	3.5853	3.6027	3.6200
2.1	3.6373	3.6546	3.6719	3.6893	3.7066	3.7239	3.7412	3.7585	3.7759	3.7932
2.2	3.8105	3.8278	3.8452	3.8625	3.8798	3.8971	3.9144	3.9318	3.9491	3.9664
2.3	3.9837	4.001	4.0184	4.0357	4.0530	4.0703	4.0876	4.1050	4.1223	4.1396
2.4	4.1569	4.1742	4.1916	4.2089	4.2262	4.2435	4.2608	4.2782	4.2955	4.3128
2.5	4.3301	4.3474	4.3648	4.3821	4.3994	4.4167	4.4340	4.4514	4.4687	4.4860
2.6	4.5033	4.5207	4.5380	4.5553	4.5726	4.5899	4.6073	4.6246	4.6419	4.6592
2.7	4.6765	4.6939	4.7112	4.7285	4.7458	4.7631	4.7805	4.7978	4.8151	4.8324
2.8	4.8497	4.8671	4.8844	4.9017	4.9190	4.9363	4.9537	4.9710	4.9883	5.0056
2.9	5.0229	5.0403	5.0576	5.0749	5.0922	5.1095	5.1269	5.1442	5.1615	5.1788
3.0	5.1962	5.2135	5.2308	5.2481	5.2654	5.2828	5.3001	5.3174	5.3347	5.3520
3.1	5.3694	5.3867	5.4040	5.4213	5.4386	5.4560	5.4733	5.4906	5.5079	5.5252
3.2	5.5426	5.5599	5.5772	5.5945	5.6118	5.6292	5.6465	5.6638	5.6811	5.6984
3.3	5.7158	5.7331	5.7504	5.7677	5.7850	5.8024	5.8197	5.8370	5.8543	5.8717
3.4	5.8890	5.9063	5.9236	5.9409	5.9583	5.9756	5.9929	6.0102	6.0275	6.0449
3.5	6.0622	6.0795	6.0968	6.1141	6.1315	6.1488	6.1661	6.1834	6.2007	6.2181
3.6	6.2354	6.2527	6.2700	6.2873	6.3047	6.3220	6.3393	6.3566	6.3739	6.3913
3.7	6.4086	6.4259	6.4432	6.4605	6.4779	6.4952	6.5125	6.5298	6.5471	6.5645
3.8	6.5818	6.5991	6.6164	6.6338	6.6511	6.6684	6.6857	6.7030	6.7204	6.7377
3.9	6.7550	6.7723	6.7896	6.8070	6.8243	6.8416	6.8589	6.8762	6.8936	6.9109
4.0	6.9282	6.9455	6.9628	6.9802	6.9975	7.0148	7.0321	7.0494	7.0668	7.0841
4.1	7.1014	7.1187	7.1360	7.1534	7.1707	7.1880	7.2053	7.2226	7.2400	7.2573
4.2	7.2746	7.2919	7.3093	7.3266	7.3439	7.3612	7.3785	7.3959	7.4132	7.4305
4.3	7.4478	7.4651	7.4825	7.4998	7.5170	7.5344	7.5517	7.5691	7.5864	7.6037
4.4	7.6210	7.6383	7.6557	7.6730	7.6903	7.7076	7.7249	7.7423	7.7596	7.7769
4.5	7.7942	7.8115	7.8289	7.8462	7.8635	7.8808	7.8981	7.9155	7.9328	7.9501
4.6	7.9674	7.9848	8.0021	8.0194	8.0367	8.0540	8.0714	8.0887	8.1060	8.1233
4.7	8.1406	8.1580	8.1753	8.1926	8.2099	8.2272	8.2446	8.2619	8.2792	8.2965
4.8	8.3138	8.3312	8.3485	8.3658	8.3831	8.4004	8.4178	8.4351	8.4524	8.4697
4.9	8.4870	8.5044	8.5217	8.5390	8.5563	8.5736	8.5910	8.6083	8.6256	8.6429
5.0	8.6603	8.6776	8.6949	8.7122	8.7295	8.7469	8.7642	8.7815	8.7988	8.8161
5.1	8.8335	8.8508	8.8681	8.8854	8.9027	8.9201	8.9374	8.9547	8.9720	8.9893
5.2	9.0067	9.0240	9.0413	9.0586	9.0759	9.0933	9.1106	9.1279	9.1452	9.1625
5.3	9.1799	9.1972	9.2145	9.2318	9.2491	9.2665	9.2838	9.3011	9.3184	9.3358
5.4	9.3531	9.3704	9.3877	9.4050	9.4224	9.4397	9.4570	9.4743	9.4916	9.5090

The Square Root of Three

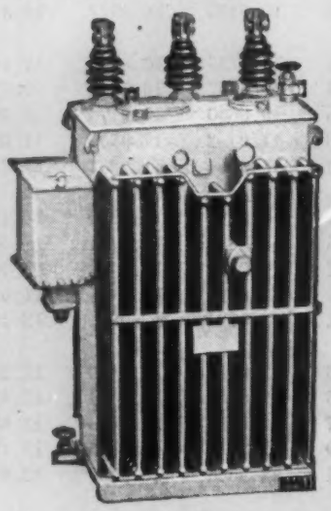
Computed by R. C. MORRIS, System Distribution Engineer,

Union Electric Co. of Missouri, St. Louis, Mo.

N	0	1	2	3	4	5	6	7	8	9
5.5	9.5263	9.5436	9.5609	9.5782	9.5956	9.6129	9.6302	9.6475	9.6648	9.6822
5.6	9.6995	9.7168	9.7341	9.7514	9.7688	9.7861	9.8034	9.8207	9.8380	9.8554
5.7	9.8727	9.8900	9.9073	9.9246	9.9420	9.9593	9.9766	9.9939	10.0112	10.0286
5.8	10.0459	10.0632	10.0805	10.0979	10.1152	10.1325	10.1498	10.1671	10.1845	10.2018
5.9	10.2191	10.2364	10.2537	10.2711	10.2884	10.3057	10.3230	10.3403	10.3577	10.3750
6.0	10.3923	10.4096	10.4269	10.4443	10.4616	10.4789	10.4962	10.5135	10.5309	10.5482
6.1	10.5655	10.5828	10.6001	10.6175	10.6348	10.6521	10.6694	10.6867	10.7041	10.7214
6.2	10.7387	10.7560	10.7734	10.7907	10.8080	10.8253	10.8426	10.8600	10.8773	10.8946
6.3	10.9119	10.9292	10.9466	10.9639	10.9812	10.9985	11.0158	11.0332	11.0505	11.0678
6.4	11.0851	11.1024	11.1198	11.1371	11.1544	11.1717	11.1890	11.2064	11.2237	11.2410
6.5	11.2583	11.2756	11.2930	11.3103	11.3276	11.3449	11.3622	11.3796	11.3969	11.4142
6.6	11.4315	11.4489	11.4662	11.4835	11.5008	11.5181	11.5355	11.5528	11.5701	11.5874
6.7	11.6047	11.6221	11.6394	11.6567	11.6740	11.6913	11.7087	11.7260	11.7433	11.7606
6.8	11.7779	11.7953	11.8126	11.8299	11.8472	11.8645	11.8819	11.8992	11.9165	11.9338
6.9	11.9511	11.9685	11.9858	12.0031	12.0204	12.0377	12.0551	12.0724	12.0897	12.1070
7.0	12.1244	12.1417	12.1590	12.1763	12.1936	12.2110	12.2283	12.2456	12.2629	12.2802
7.1	12.2976	12.3149	12.3322	12.3495	12.3668	12.3842	12.4015	12.4188	12.4361	12.4534
7.2	12.4708	12.4881	12.5054	12.5227	12.5400	12.5574	12.5747	12.5920	12.6093	12.6266
7.3	12.6440	12.6613	12.6786	12.6959	12.7132	12.7306	12.7479	12.7652	12.7825	12.7999
7.4	12.8172	12.8345	12.8518	12.8691	12.8865	12.9038	12.9211	12.9384	12.9557	12.9731
7.5	12.9904	13.0077	13.0250	13.0423	13.0597	13.0770	13.0943	13.1116	13.1289	13.1463
7.6	13.1636	13.1809	13.1982	13.2155	13.2327	13.2502	13.2675	13.2848	13.3021	13.3195
7.7	13.3368	13.3541	13.3714	13.3887	13.4061	13.4234	13.4407	13.4580	13.4753	13.4927
7.8	13.5100	13.5273	13.5446	13.5620	13.5793	13.5966	13.6139	13.6312	13.6486	13.6659
7.9	13.6832	13.7005	13.7178	13.7352	13.7525	13.7698	13.7871	13.8044	13.8218	13.8391
8.0	13.8564	13.8737	13.8910	13.9084	13.9257	13.9430	13.9603	13.9776	13.9950	14.0123
8.1	14.0296	14.0469	14.0642	14.0816	14.0989	14.1162	14.1335	14.1508	14.1682	14.1855
8.2	14.2028	14.2201	14.2375	14.2548	14.2721	14.2894	14.3067	14.3241	14.3414	14.3587
8.3	14.3760	14.3933	14.4107	14.4280	14.4453	14.4626	14.4799	14.4973	14.5146	14.5319
8.4	14.5492	14.5665	14.5839	14.6012	14.6185	14.6358	14.6531	14.6705	14.6878	14.7051
8.5	14.7224	14.7397	14.7571	14.7744	14.7917	14.8090	14.8263	14.8437	14.8610	14.8783
8.6	14.8956	14.9130	14.9303	14.9476	14.9649	14.9822	15.0000	15.0169	15.0342	15.0515
8.7	15.0688	15.0862	15.1035	15.1208	15.1381	15.1554	15.1728	15.1901	15.2074	15.2247
8.8	15.2420	15.2594	15.2767	15.2940	15.3113	15.3286	15.3460	15.3633	15.3806	15.3979
8.9	15.4152	15.4326	15.4499	15.4672	15.4845	15.5018	15.5192	15.5365	15.5538	15.5711
9.0	15.5885	15.6058	15.6231	15.6404	15.6577	15.6751	15.6924	15.7097	15.7270	15.7443
9.1	15.7617	15.7790	15.7963	15.8136	15.8309	15.8483	15.8656	15.8829	15.9002	15.9175
9.2	15.9349	15.9522	15.9695	15.9868	16.0041	16.0215	16.0388	16.0561	16.0734	16.0907
9.3	16.1081	16.1254	16.1427	16.1600	16.1773	16.1947	16.2120	16.2293	16.2466	16.2640
9.4	16.2813	16.2986	16.3159	16.3332	16.3506	16.3679	16.3852	16.4025	16.4198	16.4372
9.5	16.4545	16.4718	16.4891	16.5064	16.5238	16.5411	16.5584	16.5757	16.5930	16.6104
9.6	16.6277	16.6450	16.6623	16.6796	16.6970	16.7143	16.7316	16.7489	16.7662	16.7836
9.7	16.8009	16.8182	16.8355	16.8528	16.8702	16.8875	16.9048	16.9221	16.9394	16.9568
9.8	16.9741	16.9914	17.0087	17.0261	17.0434	17.0607	17.0780	17.0953	17.1127	17.1300
9.9	17.1473	17.1646	17.1819	17.1993	17.2166	17.2339	17.2512	17.2685	17.2859	17.3032

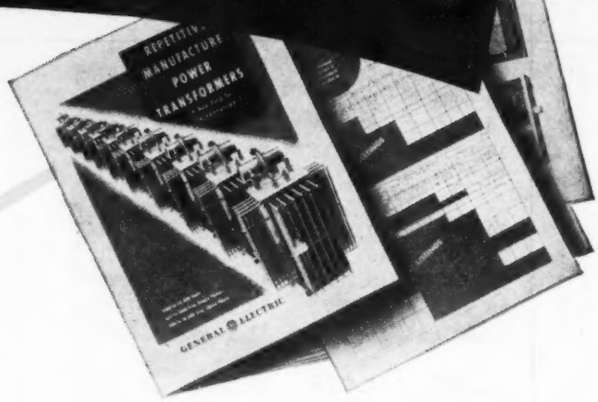


All cover bushings

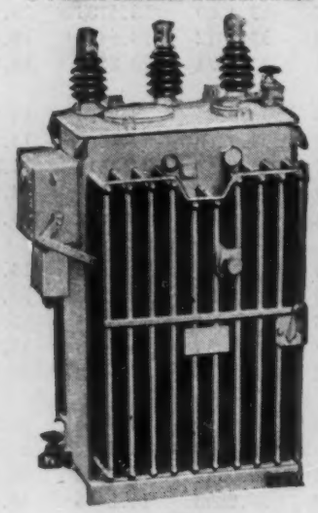


H-V cover bushings
L-V cable entrance without switch

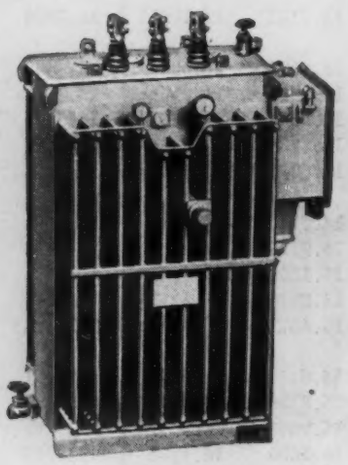
ORDERED
Right out of the catalog



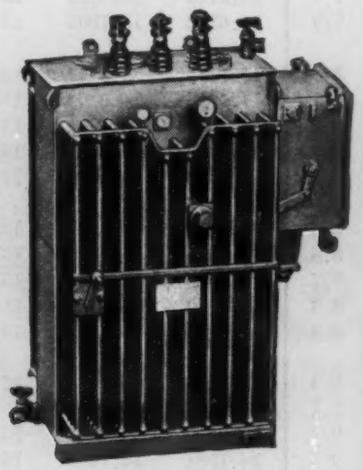
Because G-E "RM-listed" power transformers are built by repetitive manufacture, they open the way to important savings. The wide range of selection they offer (as to auxiliary mechanical features and electrical ratings) meets many of the special needs usually requiring custom-built equipment.



H-V cover bushings
L-V cable entrance with disconnect switch



L-V cover bushings
H-V cable entrance without switch



L-V cover bushings
H-V cable entrance with switch

RM-listings cover step-down transformers in the range of 2400 to 66,000 volts. That your specifications can be met with "tailor made" exactness is demonstrated by the fact that the mechanical combinations shown here, applied over the full range of standard electrical ratings, furnish some 21,000 possibilities from which to make *your* selection.

Savings are also made possible in providing additional margin for load growth and heavy short-time overloads, by using a somewhat larger RM-listed unit, which will cost less than a special "in-between" rating. (A 2500-kva, 22,000-volt RM-listed transformer will cost less than a special 2400-kva, 22,000-volt transformer.)

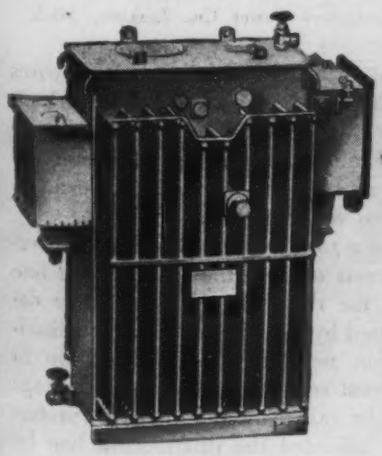
—YET DELIVERED "*Tailor made*" FOR YOUR JOB

You have merely to study the factory-assembled transformer arrangements shown here in order to realize the extent of the logical and practical simplifications which have been made possible by RM design. Installation economies are apparent at first glance.

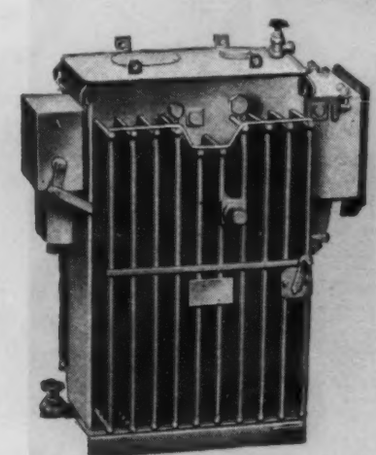
If you are considering the purchase of power transformers in the near future, it will pay you to ask for Bulletins GEA-4283 and GEA-4338A, which will give you complete data on RM design. Call your local G-E representative or write to *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

RM-LISTED POWER TRANSFORMERS

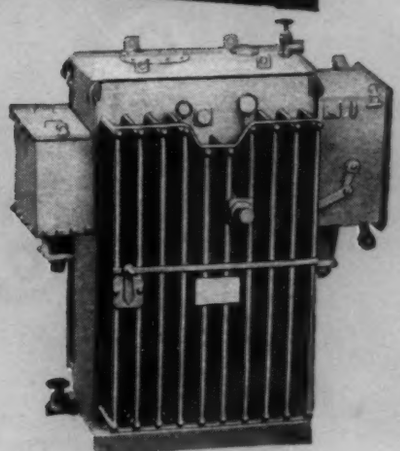
Installation of 3 G-E repetitive-manufacture power transformers with cover bushings.



H-V and L-V cable entrances without switches



L-V cable entrance with switch
H-V cable entrance without switch

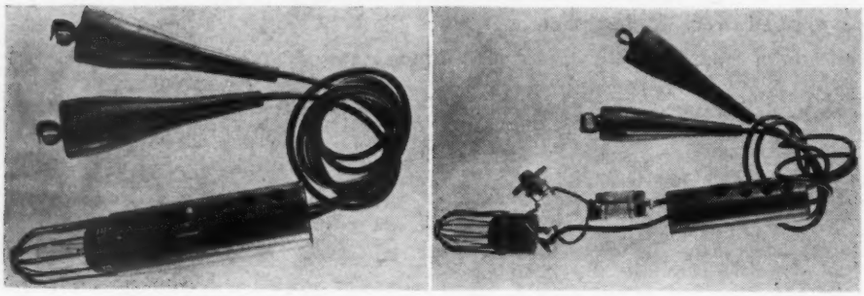


L-V cable entrance without switch
H-V cable entrance with switch

GENERAL ELECTRIC

401-91-5185

Secondary Test Set Discerns Meter Loads



SECONDARY TEST SET—Used in testing before connecting a service to a locked building this secondary test set discerns between meter load and actual load or ground, something that is difficult to do with conventional testers using two 120-v. lamps in series. Tester is shown (left) assembled and (right) with all parts exposed. Tube is 1⅝ by 6 in. long

M. F. WIDER

Overhead Lines Dept.
The Detroit Edison Co., Detroit Mich.

DIFFICULTIES IN DISTINGUISHING between a meter load and other loads or grounds on a customer's service when testing with 120-v. test lamps in series have been overcome with a special pushbutton secondary test set used by overhead line crews of The Detroit Edison Co.

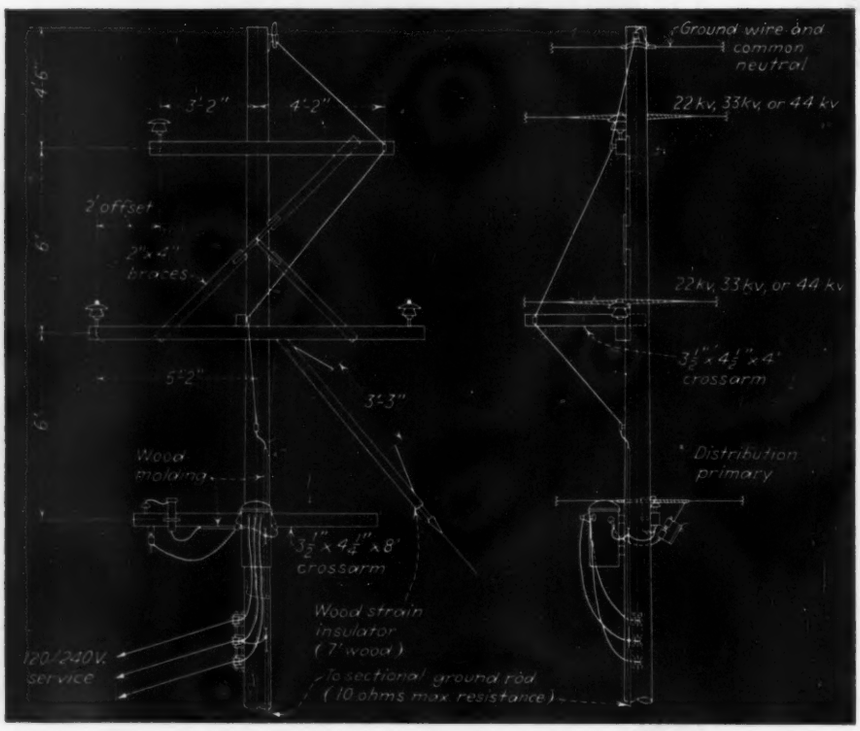
Circuit of this improved tester, when the pushbutton is in normal (open) position, consists of a 120-v. carbon filament lamp in series with a resistor. Depressing the pushbutton connects a second resistor in parallel with the lamp and first resistor.

In connecting a service to a locked building a test is always made between one hot wire of the service drop and the service entrance wires before making final connections. If no one is home and this test shows presence of a load or ground, the service is not tapped. The difficulty in making this test using two 120-v. lamps in series is that a meter load will cause the test lamps to light, giving the same indication as a load or ground.

Test Procedure

The pushbutton secondary test set eliminates this difficulty. In testing with it one lead of the test set is connected to one of the hot wires of the service drop and the other is connected to each service entrance wire in turn. If the lamp lights on all of the service entrance wires it is necessary to determine whether a load or a ground exists on the circuit or whether the indication is due to the potential coil of the meter. To do this the test is repeated and the pushbutton depressed after the test lead is connected to each service entrance conductor. After a lamp indication has been obtained on the hot service entrance wires due to a meter coil, the increased load placed on the test circuit when the pushbutton is pressed causes the lamp to dim. If the cause of the lamp indication is an actual load or ground the lamp will not dim.

• • •



DUAL PURPOSE GROUND WIRE—Transmission ground wire is used for common neutral of underbuilt 4,800-v. distribution circuit on joint transmission and distribution structure above. Cuts cost by eliminating distribution neutral

Transmission Ground Wire Used For Common Neutral

WALTER SCHMIDT and EARL KENDALL

General Engineering Department
Consumers Power Co., Jackson, Mich.

USE of the transmission ground wires as the common neutral of an underbuilt distribution circuit is a feature of some 300 miles of 46-kv. sub-transmission line now under construction or contemplated on this system.

As a result of this practice the overall costs of both the transmission line and the distribution line will be decreased by the elimination of the distribution neutral wire. In addition to the cost reduction a further advantage will be gained by the increased protection afforded the distribution line by the overhead ground wire. In fact, such construction will justify the ground wire for those transmission lines that previously were not considered sufficiently important to be protected by ground wires.

Design of the structures being built

time when you KNOW

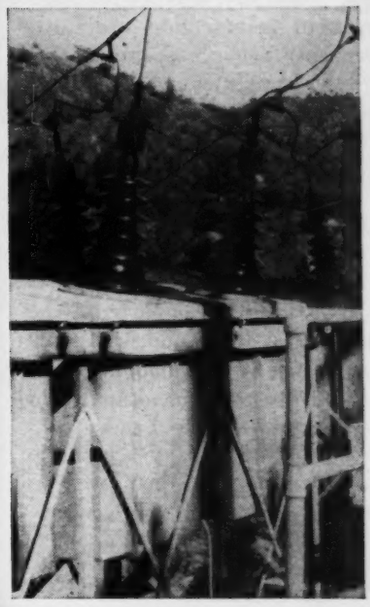
How Good it is!

"How good is it?" is a question long since forgotten as age has served only to mellow this fine old clarinet... "How good is it?" can also rightly be applied to your prospective purchase of an insulator. Again, time answers that question. Eventually, the O-B user, like the owner of any other soundly made product, forgets the question, "How good is it?" He knows!

Important as tests and standards may be, they always apply to *new* insulators; and a new insulator will not reveal its true characteristics that begin to show when heat, cold, moisture, storms, mechanical strains, and time itself, in an infinite variety have had their effect. The most meaningfull question that can be asked of an insulator is, "What has it done, and how long?" Here are a few answers to that question.

When you insulate with O-B, the time will finally come when you forget the question, "How good is it?" *You'll know!*

2651-H



Energized in 1920, these O-B oil-filled porcelain insulated bushings have met all requirements of service for 26 years.

Twenty-two years ago, in 1924, these O-B pintype insulators were installed. Today, they still fully meet all operating demands.

is shown. Generally, it is for the long-span type of construction ordinarily used for transmission lines and contemplates twelve structures per mile using 3/0 ACSR transmission and No. 2 ACSR distribution wire.

Instead of steel ground wires with ASTM class C zinc coatings, which have been used on this system, we are using three No. 8 Copperweld wires (cabled) to provide additional carrying capacity for neutral current. The common neutral is grounded at each structure to a measured maximum resistance of 10 ohms using deep-driven sectional black-iron ground rods.

Conductor configuration for the transmission circuit is of the offset type with the ground wire in the pole-top position. Top crossarm is $3\frac{5}{8}$-in. by $5\frac{5}{8}$-in. by 8-ft. yellow-pine or Douglas fir, pressure-treated, structural-grade lumber. Bottom arm has the same cross section but is 11 ft. long giving a vertical conductor offset of 2 ft. Spacing between top and bottom arms is 6 ft.

The distribution crossarm for single-phase lines is 5 ft. 7 in. long and for three-phase lines 10 ft. Ground wire riser at every pole runs from the pole top to the outside of the top crossarm and thence to a wood standoff arm directly above lower transmission arm.

This design is predicated on maintaining an insulation level of $3\frac{1}{2}$ ft. of air or 7 ft. of clear wood. The 2-ft. conductor offset and the 6-ft. crossarm spacing is used to take care of sleet jumps during unloading. Shielding angle is of the order of 45 deg. All guyed structures maintain this same insulation level through the use of wood-strain insulators.

Crossarm braces of 2- by 4-in. structural-grade lumber are joined together by a metal strap and fastened to the pole with a lag screw. The triangular configuration of the braces makes it impossible for the pole to bend between crossarms. In fact bending need not be considered above the point of guy attachment, which is slightly above lower crossarm. Poles are nominal 50 and 55 ft., class 3.

• • •

Distribution Staff Duties Summarized*

Storekeeper

THE STOREKEEPER is required to see to it that standard materials and supplies are purchased in sufficient time and quantity to insure a suitable supply being in stock at all times, such purchases being governed by conditions imposed by the superintendent of distribution. He is responsible for insuring that materials ordered conform to company specifications where such apply, and is not permitted to accept consignments which are below such standards or otherwise not as ordered. The handling of all new ladders comes under him, as does the return of all patterns used for making castings for the company from the foundry upon completion of any order and its delivery to the stores department.

The storekeeper is allowed to issue materials from stock only upon a requisition signed by a department head, except that in an emergency or under very unusual conditions he may issue materials on demand and obtain the requisition later. He keeps in stock in a prominent place at all times not less than six kerosene lanterns (two with red globes) which are cleaned, filled, trimmed and entirely ready for use. The storekeeper is not allowed to permit special leather gloves purchased for use over rubber gloves to be sold to any person. He is also charged with the duty of keeping his departmental stores records, and also records of stores transactions at the company's principal executive office.

* One of a series of presentations covering the essential duties of officials of a public utility distribution department serving between 50,000 and 75,000 meters. First installment in ELECTRICAL WORLD, October 13, 1945, page 106

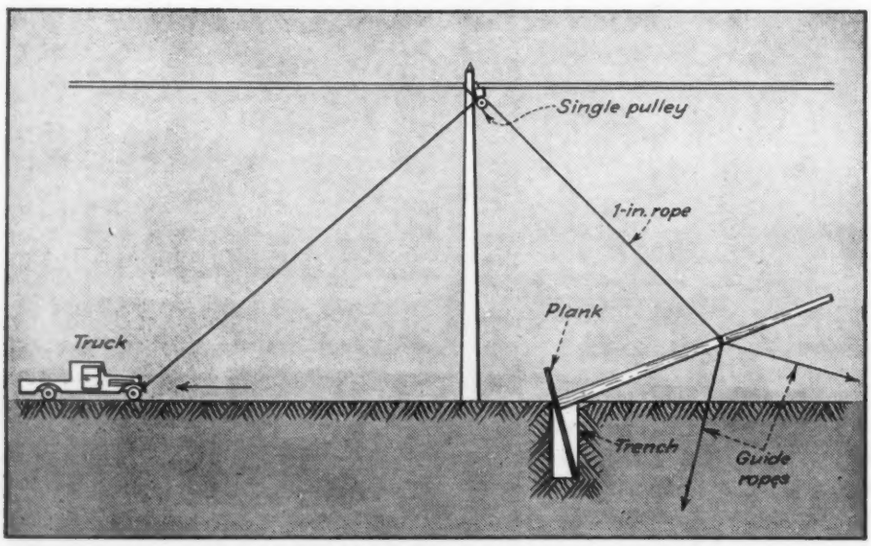
• • •

A Method of Raising Poles With A Truck

M. L. MONSON,
Superintendent
Fosston Municipal Light & Power
Fosston, Minn.

WHEN a new pole is to be located in line with an existing pole line, the method we use to raise the pole is that illustrated in the accompanying sketch.

A rope one inch or larger in diameter is employed. One end is fastened about two-thirds of the distance from the bottom of the pole to be raised. The rope is then run through a single block fastened to the top of an existing pole and down to the truck which supplies the pulling power. Two guide-ropes are used to keep the pole from swinging while being raised. Both 40- and 45-ft. poles have been raised by this method without any difficulty.



TRUCK, ROPE and single-block arrangement for raising a pole

Is Your Battery Room Ready?

Do you have adequate auxiliary power and control facilities for the expanded service you are planning? Are battery replacements, new batteries, new layouts needed? Philco battery engineers are at your service—ready with more than fifty years of experience in storage battery engineering, planning and installation. Ready with the most modern batteries obtainable—the famous Philco Floté Batteries in glass, rubber or Vitrabloc jars. Write for new catalogs of specification data. Specify Philco. PHILCO CORPORATION, Storage Battery Division, Trenton 7, New Jersey.

PHILCO

FOR 50 YEARS A LEADER
IN TELEPHONE
BATTERY DEVELOPMENT

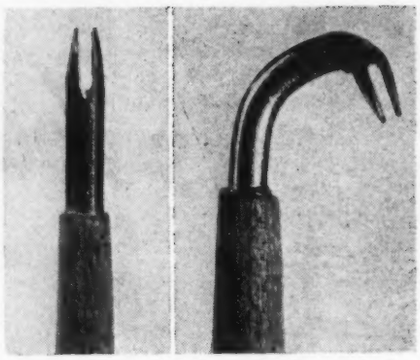
Forked Tool Aids Brush Adjustment

A TOOL which resembles a piece of dental equipment and which is used to adjust the front and rear contactor brushes of demand contact devices installed in direct-current watthour meters was recently developed. It won the inventor an award from the suggestion committee of the Consolidated Edison Co. of New York, Inc.

Developed by Leo Renner, of the company's distribution and operation department, the tool will be standard equipment in the Consolidated Edison Meter Bureau. It consists of a 5-in. long wooden shaft with a straight metal fork at one end and a curved piece of metal at the other end terminating in a similar fork.

The curved end of the tool enables a technician to reach the rear brushes without disturbing the adjustment of the front ones.

The work accomplished by the device formerly was done with an open ended needle and a small pair of tweezers. Preadjusted, the new gadget does not require the use of pressure in order to hold the brushes.

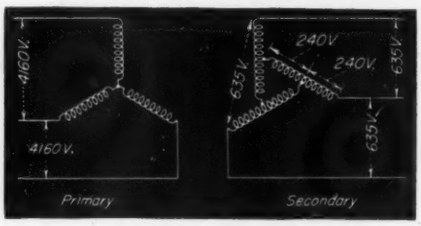


WORKING ENDS of adjusting tool for front and rear contactor brushes on d.c. watthour meters

• • •

"Extended Delta" Hook-up Useful in Industry

A LITTLE known transformer connection which is useful to an eastern utility in supplying energy to industrial plants at approximately 600 volts, 3-phase from a transformer secondary rated at 240/480 volts, is illustrated. In the diagram, the transformer shown is a standard 3-phase unit with a 2,400/4,160-volt primary and 240 or 480 volts delta secondary. By reconnecting the secondary as shown, so that the end of each phase connects between the two 240-volt coils of the next phase, the resultant phase-to-phase voltage will be $\sqrt{7}$ times the 240-volt coil voltage or 635 volts. This is about 5 percent higher than the usual 600 volt, but will ordinarily be unimportant for 600-volt power requirements. Where a service transformer is used to obtain a source of lighting voltage from two of the power phases, the slightly increased power voltage will be an advantage in that it will approximately offset the drop due to the impedance of the service transformer and lighting wiring.

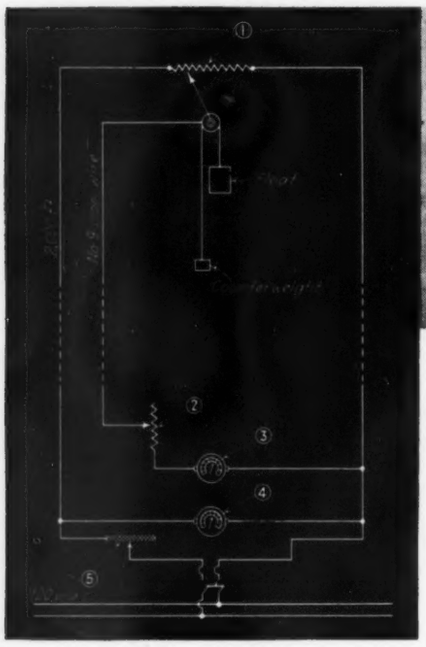


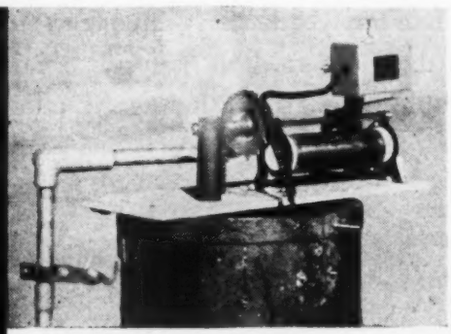
TRANSFORMER connections to supply 635-volt, 3-phase service from a 240/480-volt secondary winding

The rating of a transformer connected as shown will be about 90 percent of its normal rating, without exceeding normal hot spot temperature.

In some transformers the terminal board will be found so arranged that the connection can be made merely by proper rearrangement of the secondary terminal board links. In others slight modifications of the connections of the coil leads may be necessary.

• • •





FLOAT-ACTUATED sliding contact rheostat serves as potentiometer in water level indicator circuit

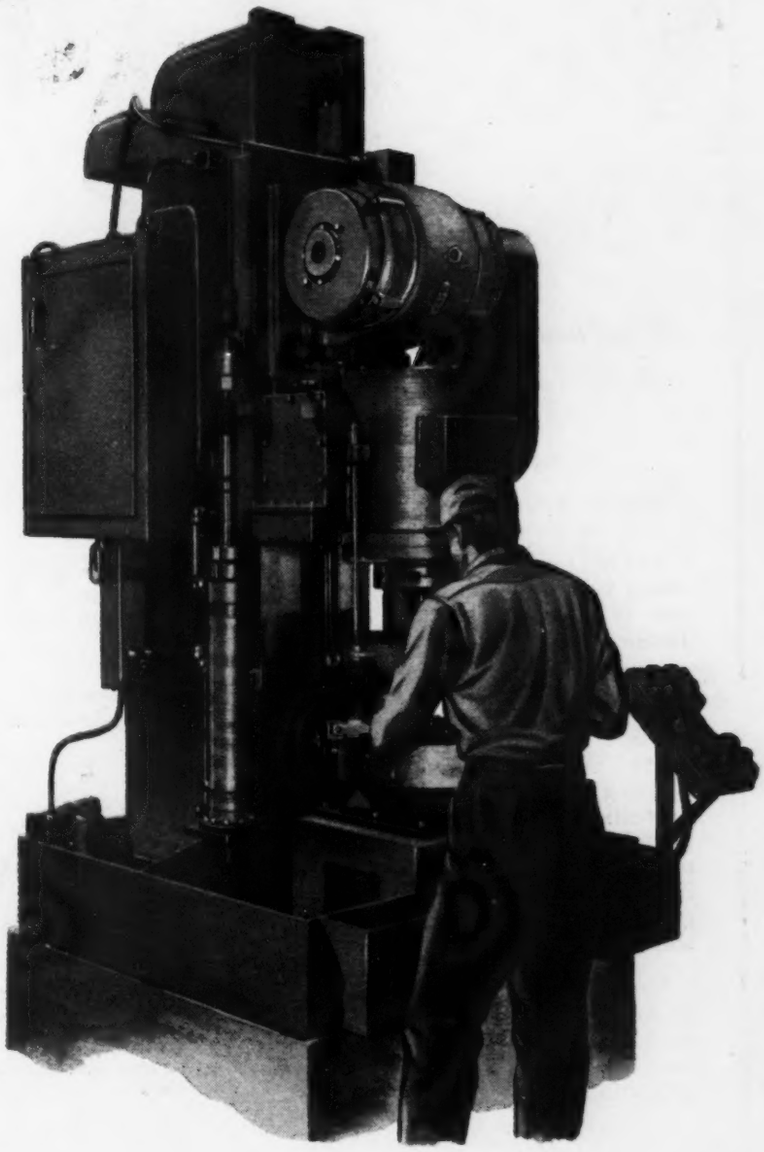
WIRING DIAGRAM and essentials of simple water stage indicator. 1, float-actuated potentiometer; 2, variable resistance; 3, voltmeter calibrated to read water level; 4, voltmeter and 5, "variac"

"Voltmeter" Water Stage Indicator

A SIMPLE and inexpensive remote water stage indicator used at a small hydro plant of Utah Power & Light Co. consists of a voltmeter calibrated to read water level and a potentiometer circuit, as shown by the accompanying drawing. Required in addition are a variable resistance of 540 ohms (2), for calibrating the voltmeter-water level indicator (3), and a "variac" (5) to adjust voltage to 110 volts on voltmeter (4) at time water reading is taken. The three-wire circuit between forebay and plant is No. 9 iron wire.

The indicator is accurate within one-tenth of a foot for a water variation of 7 ft. If voltage fluctuation on the bus

SEE FAIRBANKS-MORSE FIRST FOR MOTORS



ON countless difficult jobs Fairbanks-Morse Motors have proved their outstanding qualities. However exacting the requirements, however heavy the service, users find that these motors have the efficiency and the stamina that mean economical, uninterrupted power.

You, too, can invest in Fairbanks-Morse Motors with confidence. Fairbanks, Morse & Co., Chicago 5, Illinois.

Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

What would Nero the Fiddler have done
If "Automatic" Sprinkler had spoiled his fun?
Rome wouldn't have blazed
and a Caesar, amazed,
Would have picked up his fiddle and run.

The familiar proverb, "Rome wasn't built in a day", could be aptly applied to the thousands of businesses that are yearly destroyed by fire, hundreds of which sustain financial ruin.

In figures, this statement is even more shocking . . . over twelve billion dollars of fire loss in 30 years. And, much of this loss could have been prevented on the basis of today's fire-fighting methods and advanced fire protection equipment. "Automatic" Sprinkler systems, for example, are now available in every field of activity and lives and property are safeguarded as it was never thought possible to do in the past.

—a famous member of the "Automatic" Sprinkler Family Provides adequate protection for quench tank, transformer, oil line and other fires of flammable liquid origin.

Yes, there's an "Automatic" Sprinkler system to suit your most rigid fire protection requirements. Why don't *you* investigate *today*? There's no obligation.

"Automatic" Sprinkler

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

YOUNGSTOWN, OHIO . . . . . OFFICES IN 37 CITIES

"Automatic" Sprinkler designs, manufactures and installs a complete line of fire protection devices and systems for all types of fire hazards. Listed by Underwriters' Laboratories, Inc., and approved by Factory Mutual Laboratories

COPYRIGHTED 1946, "AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

is small, a curve drawing voltmeter-indicator may be substituted for the indicating meter. The arrangement is rugged, relatively inexpensive and may be cut out of service without changing calibration.

•

Cost of Installing A 3-Phase Regulator

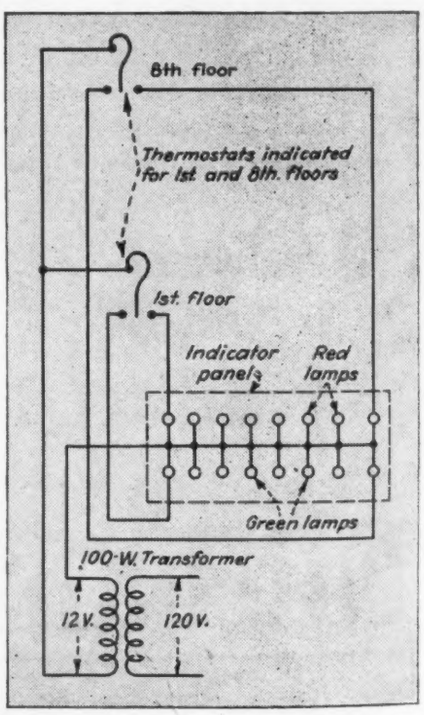
(From the field sheets of an eastern power system which included four 150-amp. current transformers in job)

Payroll	$152.19
Superintendence	13.00
Engineering	44.20
Insurance ,etc.	8.35
Stores account	16.23
Use of Truck	2.00
Brushes	0.45
One 3-Phase, 100-Amp., 4.8-kv. Induction Regulator	3,395.64
Four 150-Amp. Current Transformers	88.44
TOTAL	$3,720.50

•

Lights Indicate Building Temperature

A SERIES of signal lights are used to indicate changes in temperatures on eight floors of the building where the daily newspaper, *Newark Evening News*, is published. The signalling system was developed and installed by the engineering department of the Evening News Publishing Co., Newark.



LAMPS energized by thermostats indicate temperatures on eight floors

No "HAND-ME-DOWNS" at MOSINEE

It is the MOSINEE policy to create *custom-made* papers *only* . . . custom-made to fit our *customers' specific requirements.* There are no "stock runs" of general-purpose papers at MOSINEE . . . no "hand-me-downs" or attempts to sell you a standard paper rather than the "made-to-order" type that is essential to the functions you want paper to perform in your products and processing.

MOSINEE paper technicians cooperate in determining *what* you need in paper, and *how* you can process it best . . . then MOSINEE makes paper according to *your* needs. MOSINEE has the experience plus scientific and production controls for moisture repellency, specified dielectric strength, high tensile strength, folding, maximum-minimum pH and other vital characteristics of modern industrial papers.

That's why many manufacturers rely on MOSINEE as a dependable source for industrial papers.

MOSINEE PAPER MILLS COMPANY

MOSINEE • WISCONSIN

Essential Paper Makers

Please address your letter "Attention Dept. B"

Up there, THEY NEED Surety

TURN-CUFF LINEMEN'S GLOVES

Dependable, highly snag resistant — yet remarkably flexible and comfortable. Cuff turned up forms a "petticoat insulator" that minimizes surface creepage. Turned down, it provides a 2" longer protective gauntlet.

SLOT-TO-CENTER BLANKETS

More practical for covering spool and secondary wires, dead ends, switches, transformers. For primary or secondary lines. 45"x 45".

NON-BINDING SLEEVES

Tough for long service, made of high voltage stock for maximum protection. Adjustable — no bulk in front, cost no more than regular types.

SPECIFY SURETY

in rubber goods for maximum safety, service, satisfaction.

THE Surety RUBBER COMPANY
CARROLLTON, O.

N. J. The attendant in the boiler room is 25 ft. below ground level and during the heating season is enabled to determine temperature changes without going to the various floors or outdoors. By this system of signalling, the attendant can operate the boilers so as to increase or decrease steam pressure to the heating system. Also, a clue is given to opened windows on the floors. The lights are placed above the boiler controls so they can be seen from any location in the boiler room.

One pair of lights (one red, one green) serves one floor and is operated by a thermostat which is arranged for a 4-deg. differential. Each thermostat is locked so that the temperature differential can not be changed by an unauthorized person. A red light indicates overheating and is energized by one circuit from the thermostat when the temperature is 76 deg. F. or higher. No lights burn when the temperature on the respective floor is between 72 and 76 deg. A green light energized by another circuit from the thermostat indicates the temperature is 72 deg. or lower and more heat is required.

All 16 signal lights are mounted on the door of a panel type box which is 20 in. long, 10 in. wide, and 5 in. deep. Each light consists of a Mazda 68, 3-candlepower, 15-volt, double-contact lamp with a screw-on red or green bulls eye. All lamp and circuit connections are made on a terminal strip inside the box. Circuits from lamps to thermostats utilize conductors which had served for a watchman's clock signal system but had been replaced with portable clocks. Electric service is supplied through a 100-watt, 120/12-volt, single-phase transformer, a lower circuit voltage being an advantage for longer lamp life.

Major cost item was the eight thermostats at $8 each. The panel box was made in the shop. Total cost was less than $100 for the materials required for the installation.

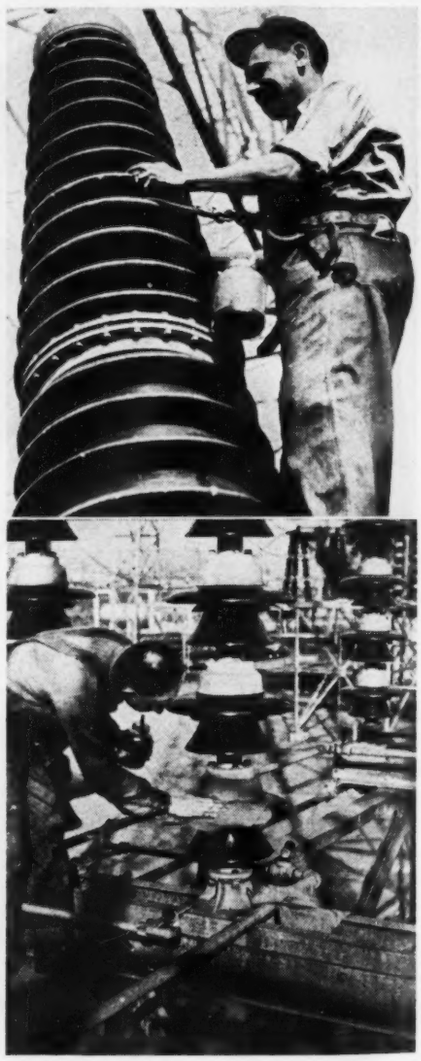
•

Naphtha, Elbow Grease Remove 220-Kv. Insulator Film

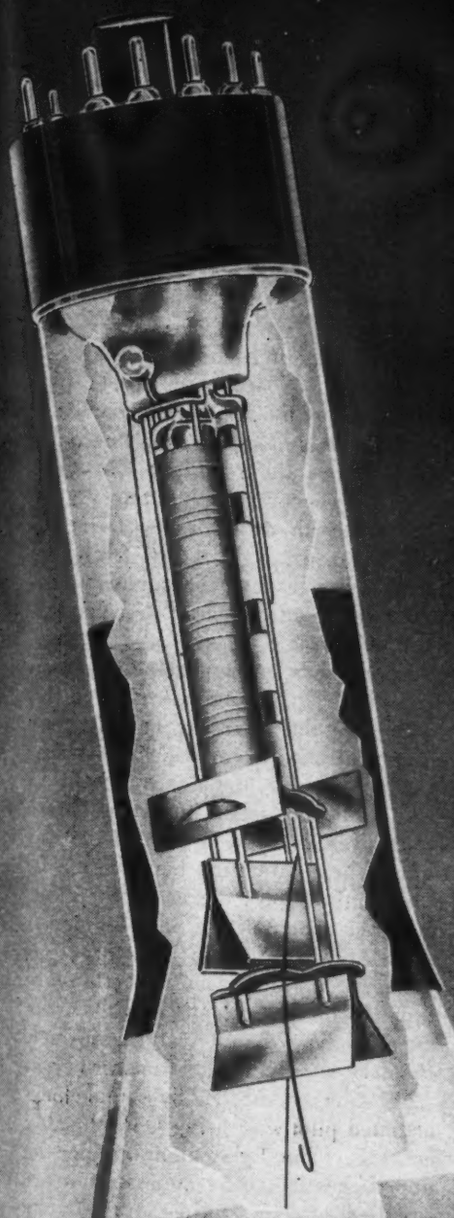
R. R. RIDGLEY

Electrical Maintenance Foreman
Southern California Edison Co.
Long Beach, Calif.

DESPITE DAILY WASHING with a permanently installed water spray system and once a week washing with a high-pressure hose, Southern California Edison Co. has found no substitute for occasional elbow grease and a solvent in keeping 220-kv. insulators clean at its Long Beach steam plant. Once a year insulators and bushings are given a good scrubbing and polishing with a rag and ordinary naphtha. Of all the solvents tried, naphtha is the only thing that will cut the salt water scum and not leave a film that shows too low an insulating value. The accompanying illustrations show men cleaning 220-kv. post insulators and an oil circuit breaker bushing by this method.



NAPHTHA CUTS salt water film on 220-kv. insulators. Unlike other solvents tried, naphtha does not leave a low resistance surface scum. In addition to such yearly cleaning, insulators are washed daily with equipment hot by permanently installed fresh water spray system. Spray heads may be seen at base of post insulator (bottom). Once a week a high-pressure hose is used also. For this washing, lines are deenergized



BUILD BETTER PERFORMANCE INTO ELECTRONIC TUBES WITH

Driver-Harris RADIO ALLOYS

For cathode-ray tubes no industry depends more on quality, precision and constancy of metals used, than radio. Small parts perform important functions and if not made of proper alloys that conform to rigid specifications the entire product is affected. Particularly is this true in the manufacture and development of Cathode-Ray Tubes.

Since the inception of radio Driver-Harris metallurgists have pioneered in developing and manufacturing special purpose alloys for this field. Today the leading manufacturers of Cathode-Ray Tubes use D-H alloys to help develop longer life and clearer images.

Driver-Harris makes alloys for every electronic tube requirement—for filaments, grids, plates, grid side rods, glass seals, cathode sleeves, socket prongs, filament support springs and mica straps. In addition there are over 80 other electrical heat *and corrosion-resistant* D-H alloys available for various electronic applications.

If the alloy you need hasn't already been developed tell us about it. Our engineers with 46 years experience are at your service.

Famous D-H Radio Alloys:

NICHROME • GRIDNIC* • NICKEL "A", "D", "E", "Z" • FILNIC**
*14 ALLOY • 42 ALLOY • 52 ALLOY • NILVAR**

Driver-Harris COMPANY

Exclusive Manufacturers of Nichrome

HARRISON, N. J.

BRANCHES: Chicago • Cleveland • Detroit • Los Angeles
San Francisco • Seattle

OSCILLOGRAPH

TELEVISION

RADAR

*Trade Mark Reg. U. S. Pat. Off.

LOAD BUILDING

Modern Lighting for Drafting Room

AFTER 100 HOURS of operation, lighting intensity of 58 foot-candles was realized in this drafting room of the Adamson United Co., Akron, Ohio. Mounted on the white acoustical tile ceiling are 106 Wakefield fixtures in continuous rows 5½ ft. apart and slanted at 45 deg. to the room axis. Each fixture holds two 40-watt tubes. Layout was made by Ohio Edison lighting engineers and installation by Carle Electric Construction Co.

•

Arterial Highway Lighted for Safety

D. E. LUCKEY

Engineering Dept., Texas Electric Service Co.
Fort Worth, Texas

HIGH-INTENSITY mercury vapor street and highway lighting is the latest municipal improvement in the modern city of Grand Prairie, Texas, which sprung from a population of 2,000 to 20,000 during the war by virtue of its unique location adjacent to the North American Aviation plant and astride the arterial highway between Fort Worth and Dallas.

A total of ninety 400-watt, 16,000-lumen, mercury-vapor lamps in G.E. G-79-D luminaires have been installed for approximately five miles along highway U. S. 80, converting the business section of Grand Prairie and its approaches into a vast white way. The installation accomplishes a dual objective. It reduces traffic hazards at a point where a high-speed arterial highway passes through a major community while at the same time lighting up and attracting business to the commercial section of the community.

In the business section of Grand Prairie a total of 30 fixtures is provided. These are spaced 200 ft. apart and staggered on each side of the 70-ft. highway. Standards are of the pipe type made by the Southern Ornamental Iron Works and support the luminaire 28 ft. above the road and 6 ft. out from the curb. Luminaires are equipped with deflectors on the curb side to direct light away from the buildings and onto the highway, increasing the effectiveness of the installation.

DEEP IN THE HEART OF TEXAS—High intensity 400-watt, 16,000-lumen, AH-1 mercury lamps in Form 79D luminaires mounted 28 ft. above the roadway on pipe-type standards illuminate business section of Grand Prairie, Texas, above. Standards were spaced 200 ft. apart on each side of street and staggered

Approaches to the business section from both directions are lighted by suspending the fixtures from 14-ft. mast arms projecting from electric distribution poles along one side of the highway at 300- to 400-ft. intervals. Thirty luminaires are used in each of the two approaches. Mounting height is 28 ft. Distribution poles are set back 50 ft. from the center of the highway which is 80 ft. wide at these points.

Lamps in the business section are supplied in multiple at 220 volts from the secondary of a 15-kva. transformer. Primary supply to the transformer at 7,200 volts is controlled by a time-clock-actuated pilot-wire using G.E. Novalux controls. The lights illuminating the approaches to the business section are supplied, also in multiple, at 110 volts from the same transformers that supply the regular incandescent multiple street lights in adjacent residential areas. Primary supply to these transformers is controlled by the same pilot-wire system that regulates lights in the business section.

•

Weeds Are Killed By Electrocution

WEED-KILLING by electricity appears to have been perfected by Gilbert Baker, inventor of the Electrovator, shown in the accompanying illustration. The Electrovator's side and rear electrodes send 12,000 volts a.c. through weed-infested soil to wither weeds by destroying their cell structure. Current passes down through stalk and into root system, crosses to other electrodes by passing through moist soil.

Here's a "Best Seller" you'll never stop reading

"3 A's OF STORELIGHTING" is General Electric's brand-new, fact-packed book for everyone who sells lamps and lighting. It's a quick-reference book with all the up-to-the-minute data on modern sales lighting...a pocket-size engineering manual that answers dozens of technical questions about lighting applications, equipment and installations.

CHANCES ARE that not every lighting salesman will neglect his best girl, stay up nights, or grab his lunch on the run to read the "3 A's of Store Lighting." But you'll get a sharp surprise when the count is in. Because this handy book gives salesmen the facts... clear, concise and accurate. It shows how lighting sells merchandise; gives tangible examples; demonstrates new design ideas; and contains a host of basic data on lamps and lighting equipment.

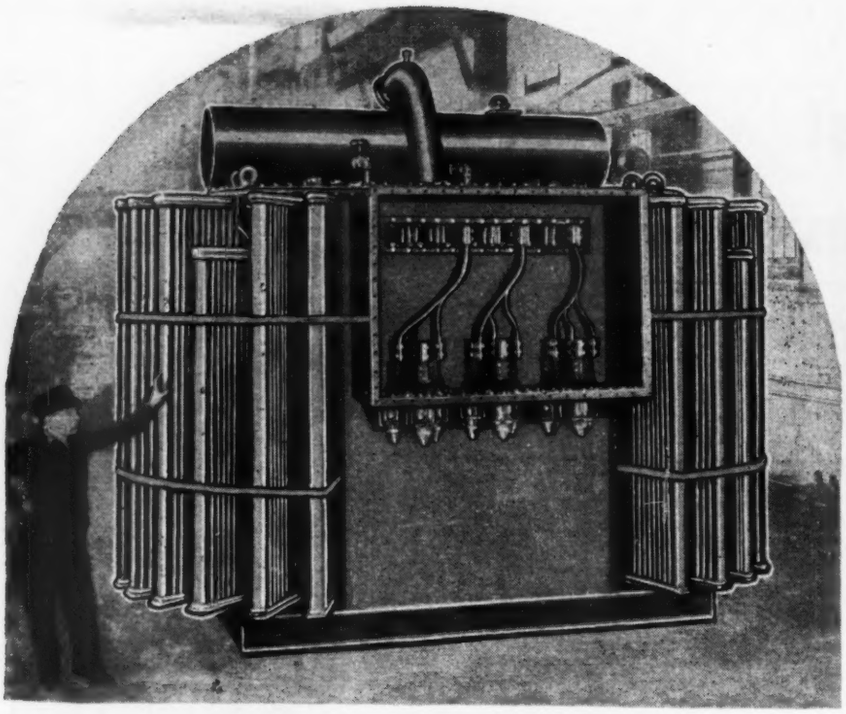
DON'T LOSE TIME! Advance reports say "3 A's of Store Lighting" will be the book-of-the-year for lighting salesmen. It's a book you can't afford to miss... a book you'll use often and profitably. It costs only 50c a copy. Call or write your nearby G-E Lamp Office for a copy NOW...better do it today!

G-E LAMPS

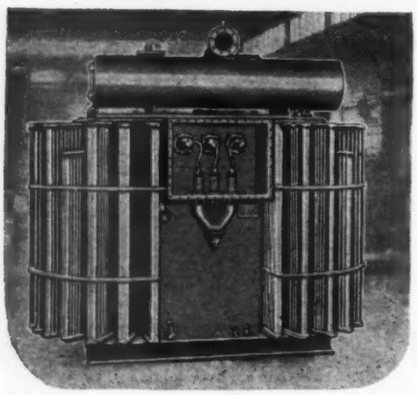
Constantly improved by research to

Stay Brighter Longer!

GENERAL ELECTRIC



UPTEGRAFF
Power
TRANSFORMERS



(Above) Uptegraff Power Transformer, 3000 KVA, 3 phase, 60 cycle, O.I.S.C., primary 11500 volts Delta connected and secondary 460 volt star connected with 230 volt reduced capacity taps brought out on each phase. View facing secondary; cover removed from terminal compartment. (At left) Facing primary, with cover removed from terminal chamber.

Uptegraff
QUALITY SERVICE

Uptegraff Power transformers are built to meet your exact needs, and designed in strict accordance with applicable standards of AIEE, NEMA, EEI and ASA specifications.

Ask for Bulletin No. 111, and
tell us your requirements.

R.E. UPTEGRAFF MANUFACTURING CO.
SCOTTDALE PENNSYLVANIA U.S.A.

Trailer contains 21-hp. gasoline engine which drives a 10-kva. generator to develop through a transformer 0.75 amp. at 12,400 volts.

The Apco Corp., Los Angeles, Calif., leases the machine to professional weed-killers who become expert in lining up

ELECTRIC weed killer uses 12 kv.

swaths by noting wilted condition in previously covered areas. Usual charge for killing weeds is $10 per acre per pass, with two passes about 20 days apart recommended for thorough job. A lawn-type machine is now under development by Apco which will have power plant parked in street and long cord to mobile electrodes. Baker learned to hate weeds while engaged for several years as field supervisor of weed control in Wyoming, and later began plotting their destruction when employed on heavy line work for REA.

•

Sound-Slide Film Tells Utility Story

S. R. FINLEY
General Superintendent
Electric Power Board of Chattanooga
Chattanooga, Tenn.

How it came into being, the services it performs, and how its income is earned and expended, these points and other information about the Electric Power Board of Chattanooga are set forth in a sound-slide film that is being used to good effect in employee and public relations activities of the Board. The film interests employees because it shows them their own jobs in relation to the whole operation and brings to their notice many things about their work they just never had thought about. On various occasions when a 30-min. program is in order, the film has been shown to appreciative audiences of luncheon groups, at dinner meetings, at P-TA sessions, and at meetings of women's clubs and church organizations.

The sound-slide film was chosen in preference to a sound motion picture because it is much easier to handle, can

be presented by various persons in the organization and does not require an elaborate set-up for presentation. The film was not expensive since photographs for it were readily available and sketches were made in the Board's advertising department.

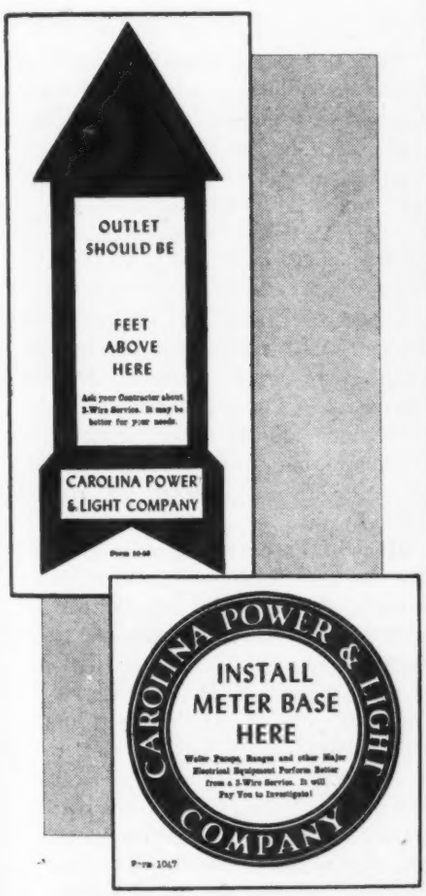
The film was first shown on November 5, 1945. Since then it has had 20 showings to employees and 18 to the public. Reproductions of the frames of film, parallel with the text of the accompanying sound, are included in the 1945 annual report of the Board.

•

Reminders Sell Farm Wiring Adequacy

T. B. SMILEY
Residential Sales Manager
Carolina Power & Light Co., Raleigh, N. C.

WHEN a new rural line is decided on by the Carolina Power & Light Co., before the engineering department starts work on construction, a lot of selling



CARDS bearing above instructions are tacked up by power company man to show farmer, whose house is to be wired, where service entrance and meter should be located

CRESCENT
Multi-Conductor Control Cables
WITH SYNTHOL INSULATION AND JACKET

Each of the 7 conductors in the CRESCENT Control Cable shown here is insulated with SYNTHOL Thermoplastic and the cable assembly as a whole is protected with a SYNTHOL sheath. SYNTHOL is more stable than rubber compounds. It is highly resistant to moisture, oils and most chemicals and will not support combustion.

The individual conductors are color coded for easy identification.

CRESCENT Control Cables are widely used for remote control operation of motors, circuit breakers and other electrical power equipment, and for many types of automatic or supervisory control circuits.

CRESCENT
WIRE and CABLE
NEMA
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

There's a

SCHRAMM

AIR COMPRESSOR

. . . for your every need!

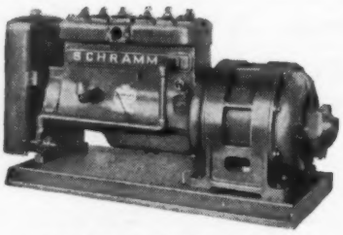
SIZES RANGING FROM 2 TO 600 CU. FT. DISPLACEMENT

DIRECT DRIVE ON BASE

Built-in Motor Drive mounted on steel base is compact and easy to install. No foundations necessary.

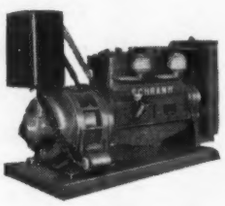
WITH "V" GROOVE PULLEY

Schramm Belt Driven Compressors can be obtained with "V" or flat belt drive suitable for twenty-four hour service and economical operation.



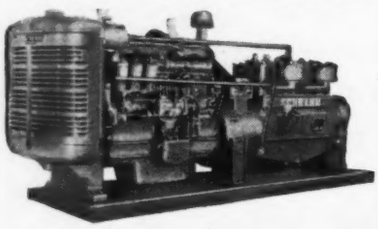
DIRECT MOTOR DRIVE WITH COOLING UNIT

Schramm 300 cu. ft. displacement with direct-connected 50 H.P. motor with cooling unit on Steel Deck Base.



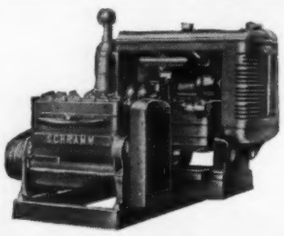
DIRECT DRIVE WITH STARTER AND RADIATOR

Both compressor and motor are mounted as a single unit on a substantial steel base with starter, radiator, and cooling unit.



DIESEL ENGINE DRIVE-IN LINE

Complete self-aligned, direct connected Diesel Engine Driven Compressor for semi-portable or stationary installation.



BELT DRIVE ON BASE WITH ENGINE

Schramm Engine Belt Drive on Base combinations are available for applications not reached by electric power service in mill, mine, and other industrial plants.

SCHRAMM INC. COMPRESSOR SPECIALISTS WEST CHESTER PENNSYLVANIA

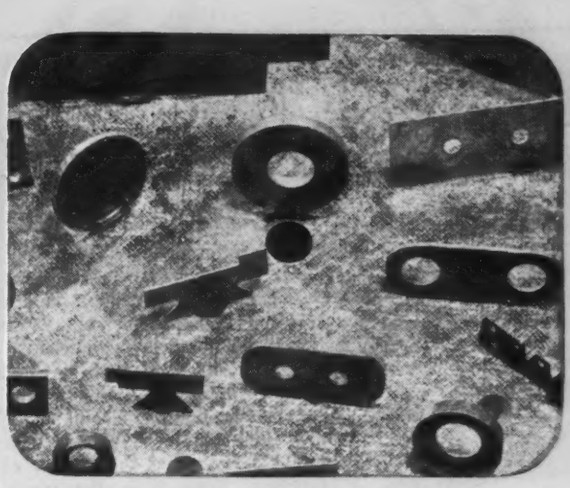
forces are turned loose on prospective customers. A company representative visits each farm to talk electric service to the farmer. A card is tacked at the proper place on the kitchen or other wall, telling the farmer where the service conductors are to be brought out; it also tells him to ask the wiring contractor about three-wire service. Another card shows where the meter is to be placed; that card tells him again that there ought to be three wires because most farm and home appliances work much better with three than with two. From the company office the farmer receives a copy of the Westinghouse booklet, "Putting Electricity to Work on the Farm," a copy of "Adequate Wiring, the Key to Modern Home Making," supplied by the Adequate Wiring Bureau, and a letter telling him he will soon have electric service, but that it will not be any better than the wiring he installs to make it useful to him.

•

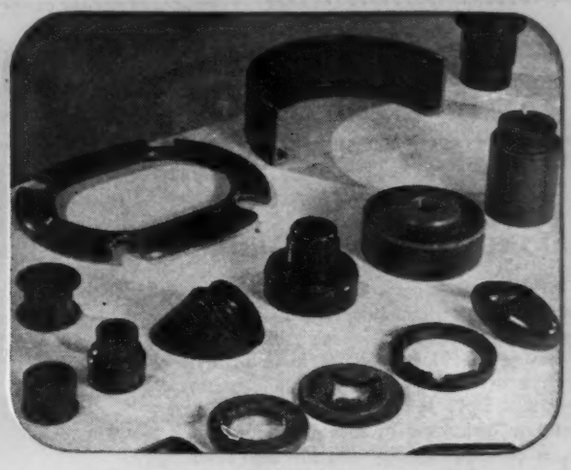
Industrial Truck a Big Energy User

INDICATIONS are that electric battery trucks in industrial plants and warehouses in this country used around 360 million kw.-hr. in 1945, according to a paper presented by C. F. Kells, Electric Industrial Truck Association, to a recent conference of power salesmen of the Pennsylvania Electric Association. From data collected by the E.I.T.A. it is estimated that at the end of 1945, 40,000 such trucks were in service. Other data from Chicago, Detroit, Cleveland, Pittsburgh, and Philadelphia show annual energy usages per truck ranging from 6,650 to 10,000 kw.-hr. with an average of around 9,000 kw.-hr.

Much of this energy usage is off-peak. But the load may not be regarded as entirely of that nature because for the 40,000 trucks there are estimated to be 51,000 batteries. This means that not all battery charging is done with trucks out of service during the night hours. This average of 1.2 batteries per truck is exceeded in all five of the cities above named, with Chicago having the highest ration of 2.6 batteries per truck and Philadelphia the lowest of 1.24. However, even in the heavy industries characteristic of the five cities most production is in the day shift and it seems reasonable that most of the battery charging will be done in the night shifts.

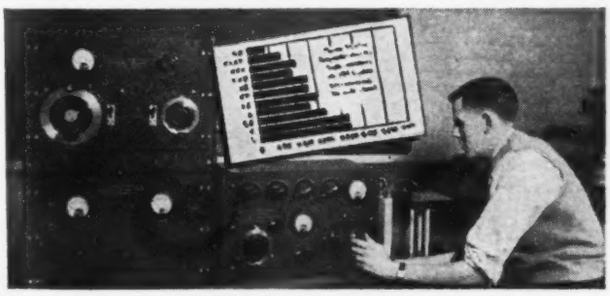


Micabond, all desirable characteristics of Mica in its most usable form.

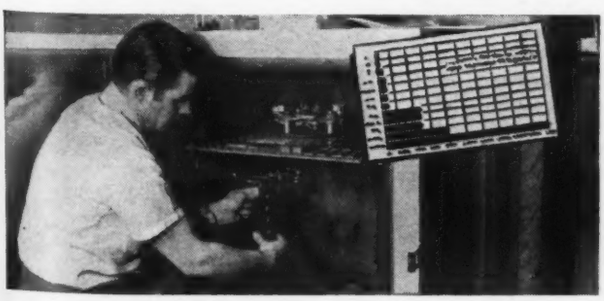


Celoron, similar to Dilecto but molded into desired shapes.

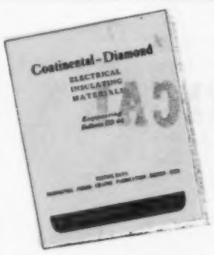
EFFECTIVE YARDSTICKS by which you can predetermine the performance of C-D insulating materials



Power Factor Test on Standard Dilecto Grades—The standard test method is called the Resonant Circuit Resistance Variation Method. Measurements are at 10^6 cycles per second. Equipment for this test consists of a stable high frequency generator, a vacuum tube voltmeter, decade resistors, and a Standard Precision Type Variable Air Condenser.



Insulation Resistance Test on Various Grades of Dilecto—This is one of several test procedures necessary to evaluate an insulating material, and for classifying various types and grades of such material. The test serves also to establish the relative uniformity of the material.



Nine tests similar to and including those above are fully reported in detail in our Bulletin ED44. You will also find valuable engineering, specification and design data as well as useful information on fabricating C-D laminated plastics, fibre and mica products. Send for this 32 page book without delay.

C-D PRODUCTS

THE PLASTICS

DILECTO—Thermosetting Laminates.
CELORON—A Molded Phenolic.
DILECTENE—A Pure Resin Plastic Especially Suited to U-H-F Insulation.
HAVEG—Plastic Chemical Equipment, Pipe, Valves and Fittings.

THE NON-METALLICS

DIAMOND Vulcanized FIBRE.
VULCOID—Resin Impregnated Vulcanized Fibre.
MICABOND—Built-Up Mica Electrical Insulation.

STANDARD and SPECIAL FORMS

Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

DESCRIPTIVE LITERATURE

Bulletin GF gives Comprehensive Data on all C-D Products. Individual Catalogs are also Available.

Continental-Diamond
C-D
Engineered Molded Plastics

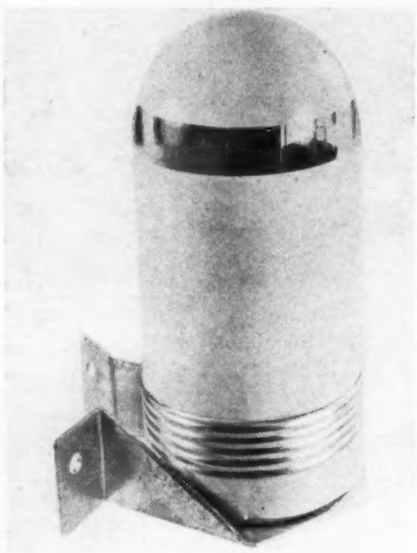
NEW EQUIPMENT

Street Light Control Distinguishes Dusk and Dawn Needs

A PHOTOELECTRIC control for multiple street lights is one of the new products recently announced by Fisher-Pierce Co., 82 Ceylon St., Boston 21, Mass. The unit is of the plug-in construction type using a 3-prong keyed twist lock. It is available for controlling up to 500 watts of incandescent lamp load. A 30-amp. capacity unit has also been developed and is available in production quantities.

The unit cuts the lights into the circuit when the north sky illumination reaches any preset level between ½ to 6 foot-candles. Illumination is extinguished when the light intensity reaches levels 2 foot-candles higher than the turn-on point.

A time delay of 15 seconds is incorporated in the circuit to render the unit free from turning off illumination because of lighting or passing lights which might be focused on it. As a safety feature, the unit is so designed that lights are left turned on in the event of any type of functional failure



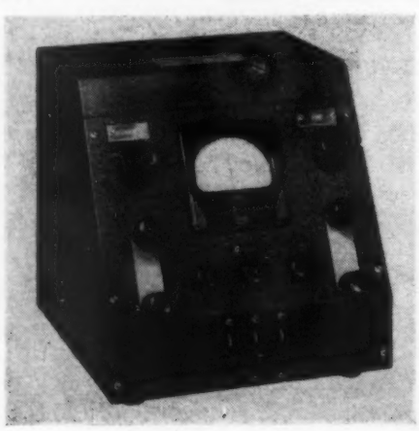
•

Low Range Limits Bridge Makes For Rapid Testing

MORE RAPID testing of great quantities of resistors is the accomplishment claimed for the new Low Range Limits Bridge, Model 81-A, announced by Associated Research, Inc., 231 South Green St., Chicago 7, Ill. The new instrument is reported adapted to testing resistance values of motor windings, transformer primaries, or secondaries, rheostats, potentiometers, lamps, shunts, or multiplier resistors—anything that offers ohmic resistance to flow of current.

It is used by connecting a resistor and pressing test and limit keys for instant reading on the open scale. If pointer of meter stays within plus or minus marked limits, accept the resistor under test; if outside, reject it. Resistance from a fraction of an ohm to 20,000 ohms is reported as checked to tolerances of ± 1 percent to ± 20 percent. Plus and minus tolerances are separately adjustable.

Model 81-A is completely self-contained. It uses three No. 6 dry cells. This internal 4½-volt battery suffices for intermittent duty for a wide range of resistances. Provision is made with binding posts for an external battery connection where higher sensitivity is required.



•

Operations Automatically Controlled, Recorded

A FULLY AUTOMATIC recorder-controller for temperature and pressure has been announced by the C. J. Tagliabue division of Portable Products Corp., 622 Park Ave., Brooklyn 5, N. Y. This instrument is reported to require only the push of a button to control processing from start to finish. By use of an adjustable cam, timing starts automatically when the temperature reaches the processing point and is terminated at the desired times. All valves, whether steam, air, water or overflow, are opened and closed as the process may require without manual attention.

A red light glows on the controller during the entire steam-heating phase of the process. When heating has been completed and steam has been shut off, the red light is extinguished and a white light appears. After sufficient time for cooling has elapsed, the white light goes out, indicating visibly to the operator that this cycle has been completed.

The entire mechanism, which is housed in a small case, is reported adaptable to many processes involving the control of temperature and pressure in the manufacture of rubber, plastics, chemicals and textiles.

•

New Aluminum Material Has Electrical Uses

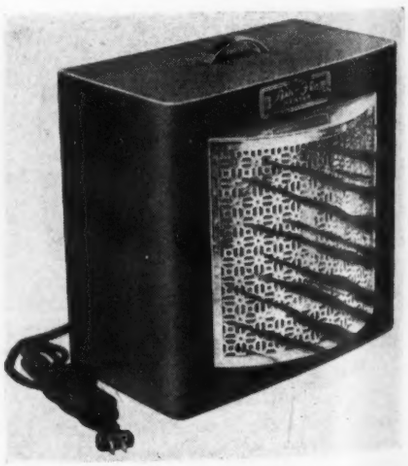
REYNALITE is light weight, high-strength building material made by bonding two sheets of aluminum to a cellulosic core. It is a product of the Reynolds Metals Co., 2000 South Ninth St., Louisville, Ky., and was developed mainly for walls, ceilings, roofs, etc., but is reported usable for electrical cabinets, junction boxes, refrigerator linings, metal ducts, etc. The material can be worked with wood-working or metal-working equipment and can be fastened with ordinary nails or screws.

•

Air Channels Keep Room Heater Case Cool

FEATURING fan-forced instant heat, the "Air-Flo" electric heater is being introduced by Acme Brands, Inc., 644 Broadway, New York 12, N. Y. The unit is portable and is rated at 1,320 watts. It was designed for use on 120-volt circuits.

Heating elements and fan are enclosed in a wrinkled-finish, sheet-metal, protective casing which has a chrome-plated grill and



What does this Mark mean to you?

Everyone knows that the Virden "V" stands for good value in lighting fixtures . . . that's an idea that has been accepted straight across the board for many years and sustained by continuous performance. But the Virden "V" also stands, of necessity, for everything that makes the good value possible.

What are some of these things?

Research is one. This embodies analysis of the market from the standpoint of style, measurement of the rhythm and tempo of design; and analysis of the various geographical segments of the U. S. from Maine to California, from the Canadian line to the Gulf, in terms of architectural value, needs, wants.

Styling is another. We have suggested some of the style influences in the preceding paragraph on research. These have to be interpreted in form and pattern by our designing department and there studied from the standpoint of available materials, metals, plastics, glass. The models must then stand up under the four critical tests of: (1) eye appeal; (2) convenience and ease of operation; (3) ease of application—minimum of work in assembly; (4) efficiency in terms of good illumination.

Production. The essence of our business is mass production of high quality lighting fixtures on a basis where careful planning and the most modern production equipment, combine with skilled labor to produce popular items at reasonable prices. The Virden "V" stands for maximum dollar-and-cent value.

Contractors and builders look for the Virden "V" on the package and find its presence there an assurance of complete satisfaction and reliable service.

The John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute

handle. One of the features reported is that of drawing the cool air through channels and then forcing this over the heated elements. This is reported to keep the case cool. The unit is reported to raise the temperature of an average-sized room from 50 to 70 deg. in approximately 18½ min.

•

Plug Fuse Indicates Overload or Short

NEW glass fuse plug which, upon blowing, indicates overload or dead short is among the recent developments of Eagle Electric Mfg. Co., 23-10 Bridge Plaza South, Long Island City 1, N. Y. It also has a magnifying center which affords clear indication of the fuse condition and the ampere rating.

For quick identification and additional check on the rating the discs are colored—10 amp., red; 15, blue; 20, red; 25, brown; and 30, green.

When the fuse blows because of overload, indication is given by a partial obliteration of the OK printed on the disc; when due to a dead short, the OK vanishes completely.

•

Improved Oil-Fuse Cutout Extends Voltage Range

ANNOUNCEMENT of an improved line of heavy-duty oil-fuse cutouts for overcurrent protection of power distribution systems in the 2,400-, 4,160-, 4,800-, and 7,200-volt classes has been made by the General Electric Co.'s transformer division, Schenectady 5, N. Y.

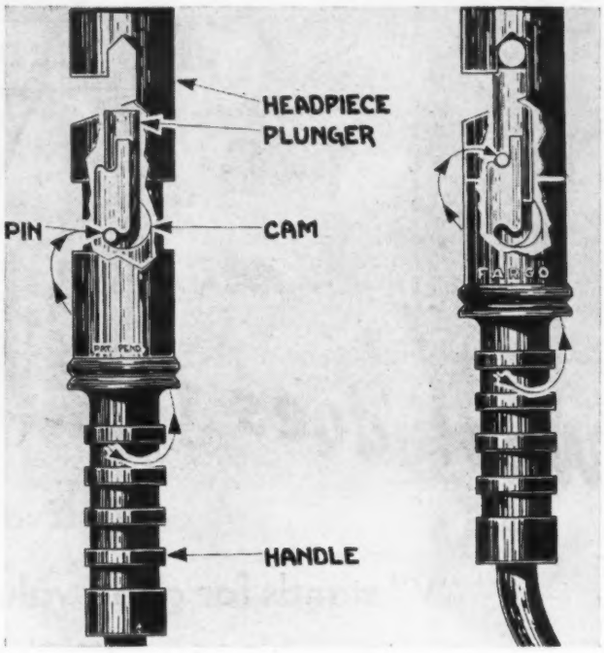
The improved cutouts utilize the new universal fuse links which provide higher interrupting ratings, clearing fault currents as high as 11,000 amp., depending upon the rating. With this new design, 100-, 200- and 300-amp. rating cutouts with maximum short-circuit interrupting ratings previously limited to 2,500 volts are now extended to 5,000 volts.

The cutouts are reported to provide a high degree of safety, to have no exposed live parts, and not to eject arc flames during current interruption.

Jumper Makes Speedy Connections; Minimizes Arcing

SPEED in making up a connection, minimizing arcing during make and break, and increasing lineman's safety are among the features claimed for a new Temporary Jumper Clamp, model No. TU-1, by the manufacturer, Fargo Mfg. Co., Main St., Poughkeepsie, N. Y.

The jumper is made up of any necessary length of the proper size stranded copper cable and a clamping device at each end. The clamping device is essentially two contact jaws, one of which is hung on the conductor; the other is snapped into position by a spring and thereby provides a quick make and break. This reduces possibility of arcing. The clamping device is covered by a Neoprene jacket which has a dielectric strength of 200 volts per mil.



Safety is reported provided by the jacket and the technique used in installing. This is done by hanging the clamping device on the conductor, pulling down lightly and turning the handle slightly. The turning releases the spring which forces the plunger cup in contact with the conductor. To remove, a downward pull is exerted on the handle which, at the same time, is twisted about one-quarter turn.

Among the tests performed on the jumper are those to determine jaw pressure, pull out and heat rise.

Jaw pressures of 120 lb. were developed on No. 4/0 7-strand conductor. Pull out values of 180 lb. were obtained with bare conductors of the same size. Included is a table showing temperatures in degrees F. of various parts of the jumper.

TEMPERATURES, Deg. F., Found in Heat Run

Time	Current Amp.	Lower Jaw	Top Jaw	4/0 7 Str Wire	Grip under Neoprene	4/0 Flexible Wire Rubber Insul.
6:10	350	Start	....	....	....	....
6:30	350	122	110	125	95	118
7:00	340	155	140	150	135	150
7:20	340	160	145	155	140	155
8:05	356	175	155	162	150	162
8:45	356	180	160	165	155	165

•

Electric Heater Produces 4,275 Btu. Per Hour

A NEW combination radiant and fan-type electric heater for use in bathrooms, nurseries, breakfast nooks and other small areas is being announced by Emerson Electric Mfg. Co., 1824 Washington Ave., St. Louis 3, Mo. The unit weighs 11 lb., has a capacity of 4,275 Btu. per hour and has an 8-in. fan that forces 150 cu. ft. of air per minute over the four heating elements. These glow in front of the concave, chromium plated, radiant heat reflectors.

The heater has an adjustable mounting for tilting up or down, within an arc of 40 deg. It is stated that the hand can be placed on any exposed part of the heater while in operation, without receiving a burn. It is finished in baked dark walnut wrinkle enamel, with chromium trimmings, has a snap-on guard and a convenient handle.

•

Preinsulated Connectors Simplify Crowding Problem

TO ELIMINATE short circuits, as well as the insulation precautions necessary where a great number of electrical connections must be condensed into a comparatively small area,

Collyer A.V.C.

(ASBESTOS VARNISHED CAMBRIC) for Severe Service

RESISTS FLAME, HEAT, FUMES, OILS, GREASE, MOISTURE, ABRASION

600 VOLT A.V.C. STRANDED CONTROL CABLE

600 VOLT A.V.C. POWER CABLE

The same imperishable rock fibre to which many an aircraft fire fighter owes his life protects Collyer A.V.C. Cable under conditions where ordinary insulations fail. Today, newly developed non-toxic resin impregnating compounds and new methods of manufacturing and testing give Collyer A.V.C. Wires and Cables additional assurance of unfailing service under the most difficult operating conditions.

Let us know your requirements.

CONTROL CABLES

Widely used in steel mills, foundries and boiler rooms, this multi-conductor cable assures safe operation of electric cranes, signal apparatus, etc.

POWER CABLES

For continuous operation at high temperatures in power plants, mines, steel mills, etc., under severe conditions. Available in single or multi-conductor for voltages up to 7500.

RHEOSTAT WIRES

All-asbestos construction withstands the high operating temperatures of electric ranges, rheostats and control panels. Furnished with copper, monel or nickel conductors.

RHEOSTAT WIRE (ALL-ASBESTOS)

Collyer

INSULATED WIRE CO.

245 Roosevelt Avenue, Pawtucket, R. I.

a new line of preinsulated terminals and end-to-end connectors has been announced by Burndy Engineering Co., Inc., 107 Bruckner Blvd., New York City 54.

On these new Hydent connectors the attached plastic insulation extends beyond the ends of the connector barrel, providing a long insulation path. Thus, it is claimed, connections can be made even on closely spaced terminal strips without danger of subsequent metal-to-metal contact, and without the insulation precautions otherwise necessary.

They are available in three sizes, to accommodate conductors from No. 22 through No. 10, and are installed with the company's standard tools.

•

Fluorescent Incorporated In Cabinet Design

ONE more adaptation of the fluorescent tube to the residential market is brought about by the new fluorescent bathroom cabinet designed by the Kahn Mfg. Co., Inc., 2051 North 19th St., Milwaukee 5, Wis. It utilizes four 20-watt tubes—two on each side of the 20-in. mirror.

The concave built-in reflectors on each side of the cabinet project the light onto the face and are reported to give an even distribution. To soften the light, the source openings are covered with Skytex refracting glass panels that slide into grooves.

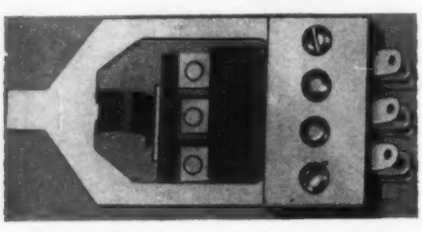
The complete unit is designed for recessing between two studs.

•

Snap Switch Handles 3 Circuits Simultaneously

NEW 3-pole, open-blade snap switch which is reported to handle three circuits simultaneously has been developed by Acro Electric Co., 1340 Superior Ave., Cleveland 14, Ohio. The switch utilizes the company's patented beryllium rolling switch construction and is made in two types.

Operating pressures for the return type construction run from 12 to 18 oz., and for the set type construction, 4 to 8 oz. Switches are rated at 10 amp. at 125 volts, alternating current, or 5 amp. at 250 volts. They are reported to have a life expectancy of more than 10 million operations.

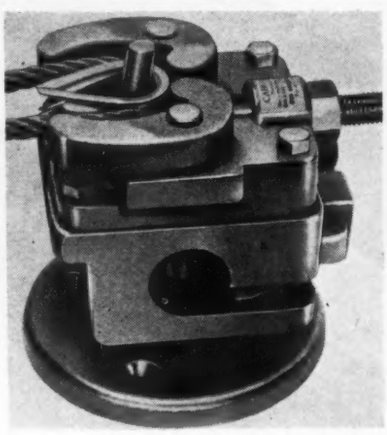


Vise Forms Loop In Wire Cable

FORMATION of a loop in a wire rope by turning a hex nut on a newly designed vise is reported by Nunn Mfg. Co., Evanston, Ill. The vise automatically compensates for rope sizes within its design range and holds the loop through the splicing or clamping operations.

The development, called Cable-Vise, is equipped with a swivel base that accommodates the vise in either vertical or horizontal position and rotates through 360 deg., clamping in any desired position.

Size No. 1., illustrated, takes rope sizes $\frac{1}{4}$ through $\frac{1}{2}$ in. Size No. 2, equipped with a hydraulic booster and accommodating rope sizes $\frac{5}{8}$ through $1\frac{1}{2}$ in., will be announced later.



•

Inductance Minimized In Storage Capacitors

A LINE of capacitors for energy storage applications which are specially designed for the fields of discharge welding, impulse generation, and flash photography is being announced by Aerovox Corp., New Bedford, Mass.

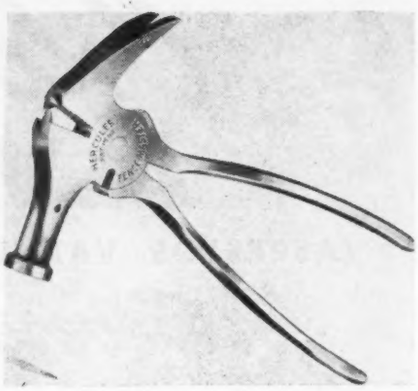
Maximum watt-second energy and minimum weight for individual applications are reported achieved in these capacitors by special ratings consistent with the duty cycle. Each unit is provided with a large number of internal connections in order to minimize inductance. Also, to handle the high currents involved, units are divided into many sections to further reduce the currents in individual connections. This new line of capacitors covers watt-second ratings from 50 to 540, in voltages from 2,000 to 4,000 inclusive.

•

Combination Tool Developed For Linemen

HERCULES "FENCE-MASTER" is a combination tool developed for telephone and power linemen and is being announced by Plastic Molded Products, Inc., 1235 West Sixth St., Los Angeles 14, Calif.

It is stated to be usable as a hammer, pliers, staple puller, wire puller, wire cutter and wire stretcher. It is $10\frac{1}{2}$ in. long and weighs $1\frac{1}{2}$ lb. The tool is made of heat treated, drop forged chrome-molybdenum steel and has a rust-proof finish.



•

Grommet Eliminates Cord Troubles on Appliances

A NEW Strain Relief, called Heyco No. 4, which is reported to eliminate all strain on appliance terminals, to absorb the pull, push and torque of a cord set, is being announced by Heyman Mfg. Co., 70 Michigan Ave., Kenilworth, N. J. It was designed to eliminate sewing and knot tying and is stated to prevent fraying of the cord. It also acts as an insulating grommet.

It is designed especially for POSV-$\frac{3}{4}$-in. wire. Other models will be announced later which will accommodate larger wire sizes.

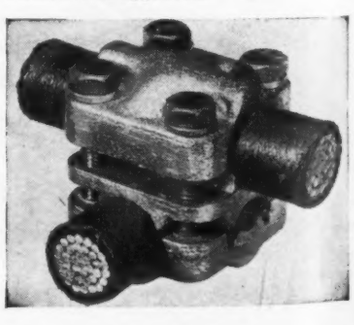
Installation is reported as quick and easy —slip the relief on the wire and snap it into the hole.

•

Connector Used on Angle Or Parallel Taps

NEW line of range taps which connect two cables at right angles or in parallel with each other is now being announced by Frankel Connector Co., 27 Vestry St., New York, N. Y. Five sizes are reported to cover a full range of cable combinations from 1,000 Mcm. to 1,000 Mcm. down to No. 1/0 to 6. The size illustrated will take a 500,000 cir. mil to 250,000 cir. mil on the main and 500,000 cir. mil to No. 1/0 on the branch.

The unit has a body of electrical bronze and utilizes Everdur hardware. It is reported as Underwriter approved.



CATALOGS and BULLETINS

A monthly digest of recent manufacturers' literature compiled by Electrical World for your convenience in securing without obligation the most recent information on electrical and allied products

CHECK ON COUPON BULLETINS DESIRED AND MAIL TO US. WE WILL FORWARD REQUESTS TO MANUFACTURERS

1 MATERIALS HANDLING EQUIPMENT AND ACCESSORIES: Bulletin H5-1 features a line of materials handling equipment, including electric hoists of various designs for a variety of applications. Monorail systems are also discussed, showing how widespread is the use of this method of handling equipment throughout industry. Accessory equipment is shown giving description of each type. Illustrations together with technical data are also included. Harnischfeger Corp.

2 SILICONE PRODUCTS: Booklet describes the use of two Silicone products (DC mold release fluid and DC7 compound) by the rubber and plastic industry. These Silicone mold release agents serve as lubricants which reduce the friction between dies and plastic materials, improve plastic flow, reduce surface striation, and afford release from the mold or from rubber bags used in low pressure laminating. Dow Corning Corp.

3 ELECTRONICS: Booklet titled "Electronics Digest" records the latest developments in this field. Includes articles on Stratovision, Mot-O-Trol, fluorescent lighting, electrolytic tin plating, X-ray inspection, and electrostatic air cleaning. In addition, the booklet includes an explanation of the electron theory and of basic electronic devices. Numerous illustrations are also included. Westinghouse Electric Corp.

4 CLIMATE CHANGERS: An 8-page bulletin discusses case histories where climate changers were installed, showing the results obtained. Equipment consists of unit heaters, convector-radiators and other accessory equipment. Units were installed in a modern candy factory, to insure comfort and constant temperature. Illustrations show the kind of working conditions obtained with the use of this equipment. A discussion of humidifier is also included. The Trane Co.

5 CONE-DRIVE GEARS: Catalog 700 contains a complete line of standardized cone-drive gears, developed to facilitate the work of the gear design engineer in selecting the size and ratio of gear best suited to each specific power transmission requirement. The catalog lists various sizes of gear sets carried in stock ranging from a center distance of 2 in. to a center distance of 18 in. Drawings giving all dimensions for pinions, gears, and spiders are included. Michigan Tool Co.

6 FIRE EXTINGUISHING EQUIPMENT: Folder features several models of fire extinguishing equipment, designed to use CO_2 as extinguishing agent. Each model is described in detail. An illustration of each type is also given. Background material is supplied, to show how equipment is used under actual fire conditions. Cardox Corp.

7 GLASS: Three bulletins cover the uses to which glass is applied in the electronics industry. Characteristics of each type are given, together with physical properties. Some typical applications given are: Vycor brand glass tubing, rod and sheet, coil forms, cylinders, instrument windows, metallized tubs, bushings, headers, etc. Corning Glass Works.

8 RELAYS: Catalog features a line of small size relays that were designed for and used extensively in aircraft during the war and are now available to all industry. The catalog is fully illustrated, contains 24 pages and is printed in three colors. A general description of each size of relay is given, including discussions on coil capacity, coil treatment, magnetic circuit, etc. Dimensional drawings show basic sizes with side, end and top views. Cook Electric Co.

9 SAFETY AND ALARM EQUIPMENT: Circular covers a new small portable instrument, known as the Stack-O-Meter, for indicating CO_2, stack temperature and draft readings. It includes specifications and describes the various features, including safety switch, portability, source of power, and accuracy, together with illustrations which show the panel operating controls as well as the complete instrument. The Davis Emergency Equipment Co., Inc.

10 INSTRUMENTS: Bulletin 1805 describes 3 different types of "Megger" instruments for measuring low resistance. These include the "Bridge-Meg" Resistance Tester—a combination Wheatstone bridge and "Megger" Insulation Tester; the

Circle numbers, sign and mail

June 8, 1946

ELECTRICAL WORLD
330 West 42nd St., New York 18, N. Y.

Please send me, without obligation, manufacturers' literature herein described and identified by numbers circled below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49							

Print your name and address and be sure to include your title

NAME .....TITLE.....

COMPANY .....

ADDRESS .....

CITY .....STATE.....

"Ducter" Low Resistance Ohmmeter, which operates by pointer deflection down to 0.000001 ohm; and the Midget "Megger" Circuit Testing Ohmmeter, which reads from a fraction of an ohm up to 200,000 ohms. James G. Biddle Co.

11 GAS ALARM SYSTEM: Bulletin 1116E describes a method for detecting and giving audible notification of hazardous gas or vapor conditions sometimes present during industrial processing operations. In addition, it describes the various combinations possible with this system. Photographs showing the control panel, which is placed in a gas free area, and the explosion-proof Analyzer Head, which detects the presence of combustible gas or vapor at point of origin, are also included. Furnished also is a description of the principle upon which the system operates, the method of operatoin, and a schematic diagram of a typical installation. Davis Emergency Equipment Co., Inc.

12 POWER BRUSHES: This 24-page booklet is designed to serve as an encyclopedia of power brush usage in manufacturing operations. Includes a full-page treatise on factors that enter into the selection of brushes. Fifteen separate tables give detailed information on a variety of factors entering into efficient power brushing operation. Illustrations graphically depict actual power brushing operations and some of the achievements possible with proper brushes and suggested techniques. The Osborn Mfg. Co.

13 PLASTICS: Booklet designed to act as a guide for presenting information on types of plastics used in industry. It is more a piece of literature outlining this company's services respecting technical problems manufacturers might have in developing a new product with plans to use plastics as the material. Tells how its council operates and how a company may put its problems before it for solution. Monsanto Chemical Co.

14 TRANSFORMERS AND COILS: Folder describes and illustrates a line of transformers for a variety of applications. Includes also rectifier power units, fluorescent lamp ballasts, hermetically sealed plate and filament transformers. Also a line of coils and special duty auto transformers. Illustrations of each type are given. Hercules Electric & Mfg. Co.

15 ELECTRICAL EQUIPMENT: An illustrated booket entitled "Lighting 25 Candles" heralds the completion of 25 years' service this company rendered to the manufacturing of a variety of electrical equipment. The supplies and services available include "anything from a wall plug to a power plant." Photographs show the manner in which various pieces of electrical equipment have been applied to diversified installations. The Electric Power Equipment Co.

16 FM BROADCASTING SYSTEMS: Here is a brochure which describes FM systems from microphone to antenna. A brief description of each model of FM sets is given, outlining frequency range, response, speech input level, distortion, power output, frequency stability, primary power, dimensions and weight. Systems range from 1 kw., 3 kw., 10 kw. and 50 kw. Illustrations accompany text. Accessory equipment is also shown. Federal Telephone and Radio Corp.

17 INDICATOR LIGHT ASSEMBLIES: Catalog 46 covers an array of pilot lights for panel board and instrument signaling. Description and dimensions of each type and size are given, including information regarding size of lamp to use. Specifications are also furnished. Back of the book contains treatise devoted to the discussion of scientific data relating to pilot lights and other related subjects. Gothard Mfg. Co.

18 INDUSTRIAL FLUORESCENT FIXTURES: Catalog 290, a pocket-size bulletin, features several models of fluorescent fixtures, designed for industrial applications. Contains 16 pages of pertinent technical data, together with illustrations and distribution curves for each unit. Model number and shipping weight, including list price and number and size of lamps to be installed, are also given. Mitchell Mfg. Co.

19 RESISTORS: Folder describes and illustrates a variety of resistors, giving types and sizes. Information given includes ohms, maximum voltage, and list price. Drawings shown contain dimensions. Ohmite Mfg. Co.

20 FIBRE PIPE AND CONDUIT: An 8-page bulletin discusses types and sizes of fibre pipe and conduit used as underground raceway for power cables, both high and low voltage, and for communication circuits. Also includes various fittings such as bends, elbows, reducers, adopters angle couplings, expansion joints, etc. Illustrations show type of underfloor duct used in shallow floors of modern buildings. The Fibre Conduit Co.

21 ELECTRICAL FITTINGS AND RACEWAYS: An 8-page bulletin outlines types of fittings and raceways used in new and old buildings. Are particularly adaptable to rewiring and extension of existing wiring for lighting modernization, provision of convenience outlets, addition or relocation of light, power, telephone, fire alarm or signal system wiring. Drawings illustrate methods used in installing product. The Wiremold Co.

22 SOLENOIDS AND ARC WELDERS: Folder describes a variety of heavy duty magnetic solenoids, designed for closing circuit breakers, switches, operation of gears, door locks, brakes, operation of spot welders, presses, shears, clutches, closing and opening of valves, etc. Includes direct-current, alternating-current and three-phase solenoids. Several types of arc welders are also shown. Hercules Electric & Mfg. Co.

23 AIR-CONDITIONING SYSTEM: Folder discusses advantages of using air-conditioning units in industry and business. A floor plan of doctor's office illustrates unit at work, showing where air ducts are installed. Chrysler Airtemp Corp.

24 TRANSFORMERS: Bound volume contains a collection of bulletins covering an assortment of transformers for a variety of applications. Bulletin contains a list of current and potential transformers; distribution transformers, power transformers and the dry type. Each type is illustrated with construction drawings showing dimensions. Technical data is also supplied. R. E. Uptegraff Mfg. Co.

25 CHARGING PLUGS AND RECEPTACLES: Bulletin 50 contains over 100 pages of technical information covering extensive line of charging plugs. Also includes a variety of adapters, junction boxes, outdoor bus storage, plugs and receptacles, receptacle and trip for circuit breaker in weatherproof case. Illustrations and specifications are given. Albert & J. M. Anderson Mfg. Co.

26 LOCKNUTS: Bulletin features a variety of locknuts designed for steel tower lines, wood pole lines, substation and power plant equipment. Contains illustrations and dimensional drawings. Price list is also furnished. The Palnut Co.

27 DRY ELECTROLYTIC CAPACITORS: A 24-page booklet features a variety of capacitors. Explanation charts are shown, together with surge voltage data. Also included are characteristic curves and capacitor marking. Test data is also given. P. R. Mallory & Co., Inc.

28 WIRE AND CABLE: Bulletin contains complete information on flexible stranded copper cables, braided copper cables, bare solid wire, tinned solid wire, concentric stranded cables and automotive ground cables. Tables include pertinent technical data. Specifications for each type of wire and cable discussed are furnished. Flexo Wire Co.

29 ELECTRICAL CONTACTS: Catalog 152 discusses a wide selection of electrical contacts made of tungsten, silver, platinum tipped, composite or welding tips. Controlling specifications for contact design are given, together with data on design factors. Tables are shown giving standard contact types. Physical characteristics of metals used in these contacts are also discussed. Callite Tungsten Corp.

30 INDUCTION HEATING UNITS: Folder describes and illustrates the electronic-tube type induction heating unit built for shop usage. It is designed for applications such as hardening, brazing, annealing, heating for forming small parts, hardening of cutting edges, and shallow penetration in surface hardening. Specifications are given. The Ohio Crankshaft Co.

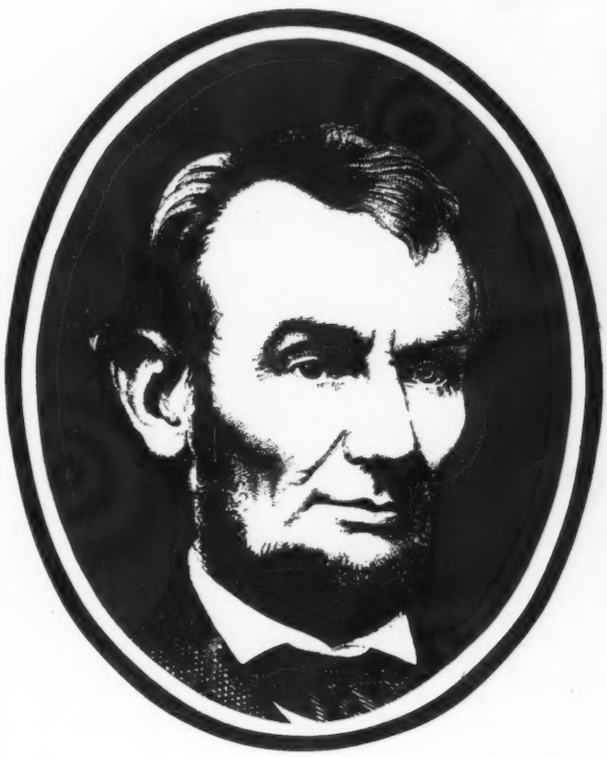
31 FIBRE MATERIALS: Folder discusses infinite uses of fibre in designing a variety of products for various industries. A few of the possible uses for the electrical industry are: commutator rings, condensers, controllers, cut-outs, electro-magnets, etc. Table showing comparisons of fibre with other basic materials is given. Physical properties are also supplied. Wilmington Fibre Specialty Co.

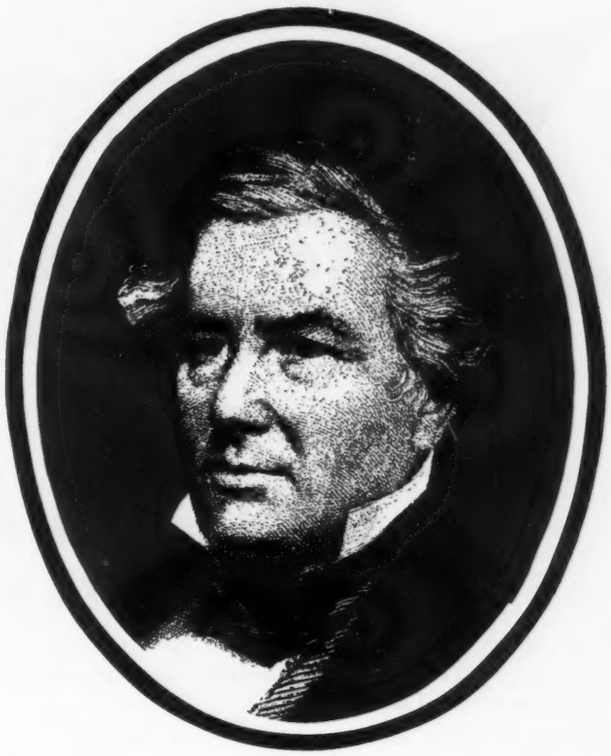
32 CONDULETS: Bulletin 2587 contains information on a variety of condulets. Written in Spanish, it is presumably intended for the South American market. Illustrations and descriptions of product are shown. Contains also complete technical data. Crouse-Hinds Co.

33 FITTINGS AND RACEWAYS: Catalog 16A contains up-to-the-minute in-

Both of these men were Presidents

– *do you know them?*





You know Abe Lincoln at a glance. His picture has been made familiar by repetition millions of times.

Millard Fillmore was a good man, too, but only a few would recognize him.

If you were a schoolteacher, which one of these presidents would you prefer to "sell" to your class?

The answer is obvious. It's Lincoln, of course.

There are "Fillmores" and "Lincolns" in every field of business. This is particularly true of the home freezer market today.

Deepfreeze is the greatest name in home freezers. It's the talked-about home freezer. It's the home freezer easiest for you to sell because it's the best known. Millions are familiar with it.

Deepfreeze is an exclusive, fully protected brand name.

It is registered in the U. S. Patent Office.

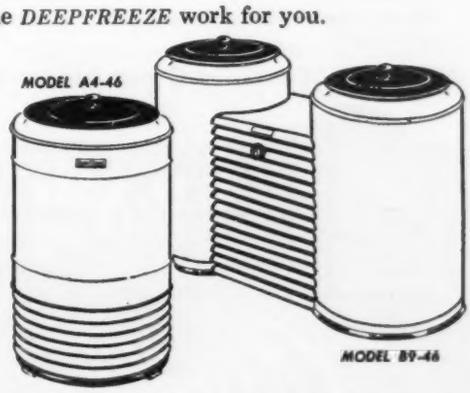
The name Deepfreeze can only be used by dealers selling the one and only Deepfreeze home freezer, made only by the Deepfreeze Division of the Motor Products Corporation.

Make the name *DEEPFREEZE* work for you.

Deepfreeze

TRADE-MARK REG. U. S. PAT. OFF.

the talked-about home freezer



DEEPFREEZE DIVISION • MOTOR PRODUCTS CORPORATION • NORTH CHICAGO, ILLINOIS

Visit our display in Rooms 1447-48, The Merchandise Mart, Chicago, during the International Home Furnishings Market, July 8-20, 1946.

HOT WATER BY wire

PACKAGED IN GLASS!

SMITHway

PERMAGLAS

WATER HEATERS

Hot Water by Wire... the cleanest, most trouble-free automatic heat there is. SMITHway immersion-type elements (dual or single) supply an abundance of hot water.

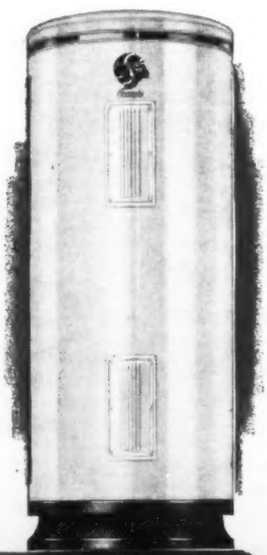
Stored in Glass... in *Permaglas,* glass-fused-to-steel! Sparkling blue, mirror-smooth – sanitary as a clean drinking glass. *Permaglas* CANNOT rust or corrode under *any* water condition.

There's Only ONE Permaglas

Only A. O. Smith produces the truly modern water heater with the tank of changeless glass-fused-to-steel – the heater that stores and delivers hot water as sparkling clean as the source itself.

Ample capacities, even for the new automatic washing machines and dishwashers.

The SMITHway *Permaglas* story is the newest, most dramatic sales story in the appliance business. Get the whole story for yourself, today. Send for *The Inside Story of Permaglas.*



***PERMAGLAS*—a Great Aid to Sales**

A. O. SMITH Corporation

SMITHway Permaglas GLASS-FUSED-TO-STEEL ELECTRIC WATER HEATERS

34 TELEPHONE DROP WIRE: Folder features new drop wire with its outer casing of neoprene. Construction of product is commented upon in great length. Some physical characteristics covered are weather resistance and flame resistance. Tests performed on product are discussed. The Whitney Bake Co.

35 EXTRUDED PLASTIC TUBING: Booklet describes and illustrates extruded plastic tubing designed for a variety of uses. Dielectric strengths are discussed. Used principally to reduce chatter and vibration in light flexible shaftings. Test data given for each application. Irvington Varnish Insulator Co.

36 FLOODLIGHTS: Bulletin 110 describes and illustrates a variety of floodlights for indoor and outdoor application. Specifications and technical details are given. Tables, accompanying each illustration, give size of lamp used for each floodlight. New post-war models are also discussed. Steber Mfg. Co.

37 FLUORESCENT LIGHTING: Two folders given here discuss engineering details of two specially designed fluorescent lighting luminaires. The first folder features the "Trofferlite," the second folder presents the "Officer." Both luminaires are of recent design. Engineering details are furnished. Drawings and illustrations show manner in which these two units are installed. Distribution curves are also given. Leader Electric Co.

38 INSULATORS: Four-page folder describes a variety of medium-voltage pin-type glass insulators for electrical distribution systems. Outline drawings of each type are shown with tables giving pertinent technical data. Owens-Illinois Glass Co.

39 CENTRALIZED CONTROL EQUIPMENT: Compact folder features control equipment used primarily for the control of street lights, electric water heaters and other off-peak appliances. This equipment is particularly adaptable to series operation, in such installations as: mercury vapor, sodium and multiple filament lamps for street and high illumination. Engineering details are furnished also. Great American Industries, Inc.

40 SUPERVISORY ANNUNCIATORS: Bulletin 120 discusses annunciators, specially designed to meet all requirements of units entrusted with the supervision of expensive equipment. Several types of annunciators are discussed, among which are the bulls eye lamp type, manual reset type, illuminated stencil type, etc. Complete description of each type is given, together with methods of installing and mounting. Auth Electric Co. Inc.

41 INCANDESCENT LAMPS: This is No. 2 of the "Know How" lighting series, published by this manufacturer. A digest of facts and data, this 24-page booklet is complete with technical information about incandescent lamps. Written exclusively for the layman, the material contained in the text is non-technical language. It answers such simple questions as "What's an incandescent lamp? What bulb to use

SERVING YOU THROUGH SCIENCE

NEW CODE CHANGES SHOW PROGRESS IN BRANCH CIRCUIT WIRING

		R	RH	RW	RU	T (Formerly SN)	TW
Maximum Operating Temperature	1940	50 C	75 C	50 C	60 C	60 C	
	1946	60 C	75 C	60 C	60 C	60 C	60 C
Insulation Wall Thickness	1940	3/64"—#14, 12, 10 AWG 1/64"—#8—2 AWG 5/64"—#1—4/0 AWG	3/64"—#14, 12, 10 AWG 4/64"—#8—2 AWG 5/64"—#1—4/0 AWG	3/64"—#14, 12, 10 AWG 4/64"—#8—2 AWG 5/64"—#1—4/0 AWG	18 Mils (1.15/64) #14, 12, 10 AWG	2/64"—#14, 12, 10 AWG 3/64"—#8 AWG 4/64"—#6—2 AWG 5/64"—#1—4/0 AWG	
	1946	2/64"—#14, 12 AWG 3/64"—#10 AWG 4/64"—#8—2 AWG 5/64"—#1—4/0 AWG	2/64"—#14, 12 AWG 3/64"—#10 AWG 4/64"—#8—2 AWG 5/64"—#1—4/0 AWG	3/64"—#14, 12, 10 AWG 4/64"—#8—2 AWG 5/64"—#1—4/0 AWG	18 Mils (1.15/64) #14, 12, 10 AWG 25 Mils (1.6/64) #8, 6 AWG	2/64"—#14, 12, 10 AWG 3/64"—#8 AWG 4/64"—#6—2 AWG 5/64"—#1—4/0 AWG	2/64"—#14, 12, 1 AWG 3/64"—#8 AWG 4/64"—#6—2 AWG 5/64"—#1—4/0 AWG
Uses (Under National Electrical Code)	1940	General Use	General Use	General Use or in Wet Locations	Rewiring Only	Rewiring Only	
	1946	General Use	General Use	General Use or in Wet Locations	General Use May be used in Non-Metallic Sheathed Cable	#14—4/0 AWG General #14—2000 MCM Open Work	#14—4/0 AWG General #14—2000 MCM Open Work
Sizes (Under National Electrical Code)	1940	#14—2000 MCM	#14—2000 MCM	#14—2000 MCM	#14, 12, 10 AWG	#14—4/0 AWG	
	1946	#14—2000 MCM	#14—2000 MCM	#14—2000 MCM	Now Approved in Sizes #14—6 AWG	#14—4/0 AWG General #14—2000 MCM Open Work	#14—4/0 AWG General #14—2000 MCM Open Work

Current Carrying Capacity (In Amperes)

1940																	
Size	Conduit*	Open Wiring	Size	Conduit*	Open Wiring	Size	Conduit*	Open Wiring	Size	Conduit*	Open Wiring	Size	Conduit*	Open Wiring	Size	Conduit*	Open Wiring
14	15	20	14	22	29	14	15		14	18		14	18				
12	20	26	12	27	37	12	20		12	23		12	23				
10	25	35	10	37	50	10	25		10	31		10	31				
8	35	48	8	49	69	8	35					8	41				
6	45	65	6	65	94	6	45					6	54				
4	60	87	4	86	125	4	60					4	72				
2	80	118	2	115	170	2	80					2	96				

1946																	
14	15	20	14	15	20	14	15	20	14	15	20	14	15	20	14	15	20
12	20	25	12	20	25	12	20	25	12	20	25	12	20	25	12	20	25
10	30	40	10	30	40	10	30	40	10	30	40	10	30	40	10	30	40
8	40	55	8	45	65	8	40	55	8	40	55	8	40	55	8	40	55
6	55	80	6	65	95	6	55	80	6	55	80	6	55	80	6	55	80
4	70	105	4	85	125	4	70	105				4	70	105	4	70	105
2	95	140	2	115	170	2	95	140				2	95	140	2	95	140

*Not more than 3 conductors in conduit, raceway or cable. For more than three conductors in conduit, raceway or cable, reduce current carrying capacity in accordance with 1946 Code.

NOTE: According to Underwriters Laboratories; 1946 Code—R, RH and RW—may be labeled after April 1, 1946. Manufacturers need not produce until November 1. When production does start, Underwriters' labels must be applied and tags must be marked: "1946 Code."

1940 Code—R, RH, RW—may be labeled until November 1, 1946. Stocks in inventory after November 1 may be used until supply is exhausted.

Laylex (RU) is America's smallest diameter, lightest weight rubber insulated branch circuit wire. Laminated construction and perfectly centered conductors insure electrical safety.

Write for new wall hanger soon available. In meantime, use this chart

UNITED STATES RUBBER COMPANY

1230 AVENUE OF THE AMERICAS • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

Everything you need . . .

FOR ELECTRICAL RESISTANCE MEASUREMENT

From .01 ohm to 200 megohms - IN ONE "MEGGER"* UNIT

The "BRIDGE-MEG" Resistance Tester

HERE is a combined "Megger" Insulation Tester and Wheatstone Bridge that has been proved by years of service, and that can be used to measure almost any resistance encountered in electrical equipment—anywhere and at any time. It measures conductor resistance from as low as .01 ohm up to 999,900 ohms, and can be supplied withVarley loop test facilities. It measures insulation resistance from 10,000 ohms up to 200 megohms. Having a self-contained constant pressure generator rated at 250, 500 or 1000 volts d-c, it is independent of batteries or outside source of power supply, and is portable, compact and simple to operate.

To all who have electrical equipment to install or to maintain, and who appreciate the advantages of one superior instrument for all resistance measurements, we recommend and offer the "Bridge-Meg" Resistance Tester. Weight 14 lbs. Dimensions 7" x 8¾" x 12".

For complete description write for Bulletin 1615-W.

* Trade Mark Reg. U. S. Pat. Off.

JAMES G. BIDDLE CO. • 1316 ARCH STREET PHILADELPHIA 7, PA.

where?" The entire text includes colorful drawings and illustrations. Westinghouse Electric Corp.

42 LOCKNUTS: This is essentially a service manual. Its 16 pages are devoted to methods used in obtaining the maximum results from this manufacturer's product. The entire text is replete with illustrations, drawings and application pictures. Of especial value are the sections covering the use of locknuts on power transformers. The Palnut Co.

43 TIMERS, RELAYS & SWITCHES: Catalog 2 features a line of automatic time controls. Includes interval timers, automatic reset timers, time delay relays, cycle timers, impulse timers, duplex cycle timers, percentage timers, multi-contract timers, running time meters, etc. Illustrations and technical details are given. The R. W. Cramer Co. Inc.

44 VERTICAL TURBINES: Bulletin 38 contains 16 pages of technical material covering improved vertical type turbines for a variety of applications. Illustrations of each type are given showing units in operation. Outline drawings are also given, revealing the salient features of each type of turbine. Tables including technical details are furnished. The James Leffel & Co.

45 LIGHTING: Bulletin WB-37 is an illustrated booklet titled "How To Hang The Star." Its 32 pages are devoted to showing the progressive steps required in hanging this particular fixture. It starts with the first step: taking the fixture from its wrapper, and, from there, progresses through each step till the fixture is hanging on the ceiling. F. W. Wakefield Brass Co.

46 INDUSTRIAL LUMINAIRE: Illustrated folder features a specially designed cold cathode fixture, intended primarily for industrial applications. May be installed as individual units or in continuous runs. Interlocking lugs on hanger brackets provide position connection of raceways. Table of computed foot-candle results, together with candlepower distribution curves, are given. Federal Electric Co., Inc.

47 DIESEL ENGINES: Bulletin 122 features diesels designed for use in central generating stations, etc. Cutaway views of important sections of engine are shown. All engines illustrated in this bulletin are of the two-cycle type, available in sizes of 500 kw. to 6,000 kw. in a single unit. Pictures are given showing actual installations. Nordberg Mfg. Co.

48 INSTRUMENTS: Catalog 17 contains 18 pages devoted to ammeters, voltmeters and wattmeters. These instruments comprise three different systems: (1) moving-coil, (2) electromagnetic, (3) electrodynometer. Included also are shunts, resistors and special instruments. Dimensions for each type are given in construction drawings, with illustrations accompanying each drawing. The Norton Electrical Instrument Co.

49 TUNGSTEN COPPER ALLOYS: Bulletin 158 features a group of tungsten copper alloys used in electric resistance welding for circuit breakers, motor controllers, heavy duty relays, elevator controllers, industrial control contacts, etc. Callite Tungsten Corp.

NEWS ABOUT PEOPLE

Holophane Co. Elects T. W. Rolph President

Announcement has been made by the Holophane Co., Inc., of the election of Thomas W. Rolph to the position of president. Mr. Rolph assumes his new duties July 1 and will be located at the company's headquarters in New York City. He succeeds Charles Franck who will act as chairman of the board after June 30. Mr. Franck has been general manager for close to 30 years and president during the last 16 years.

T. W. ROLPH

Mr. Rolph has served the organization for 25 years, first as head of the street lighting department, then chief engineer. Several years ago he was made vice-president and was placed in charge of manufacturing and engineering. A year ago he was elected to the board of directors.

A graduate of Cornell University, Mr. Rolph entered the field of illuminating engineering following graduation. He is a fellow of the Illuminating Engineering Society, has been active on many I.E.S. lighting committees and has contributed numerous articles to technical publications. In 1935 he spent several months abroad studying lighting practice in the various European countries. In 1944, he served as president of the Ohio Society of Professional Engineers.

Some fifty United States patents on luminaires and lighting devices have been granted to him, also a considerable number of patents issued by foreign countries. In 1940 Mr. Rolph was named by the National Association of Manufacturers "A Modern Pioneer on the Frontier of American Industry."

•

▶ HOMER M. PACE, vice-president of the South Carolina Power Co., Charleston, has been elected president of the Southern Association of Science and Industry.

▶ TAYLOR MORAN, formerly vice-president of Stevenson and Kellogg Limited, has been made vice-president of the B. C. Electric Railway Co., Ltd.

▶ THOMAS M. BURTON has been appointed chief engineer of steam stations, Boston Edison Co., succeeding the late Richard Brown. He joined the company in 1916 as a watch engineer, and in 1929 became assistant chief engineer of the L Street station in South Boston. In 1941 he was named assistant chief engineer of steam stations, and held that position until May 15 of this year, when he assumed his present responsibilities. C. R. IRVING and H. E. STICKLE have been named assistants to the chief engineer of steam stations.

▶ BERT MERSON, present labor adviser to the Progressive Conservative party of Canada, has been chosen unanimously by Toronto City Council as city appointee on the Toronto Hydro-Electric Commission. He fills the position vacant since the death of Joseph Gibbons. Mr. Merson has been a resident of Toronto for 39 years.

Reorganize Transformer Unit; Assign New Duties

A reorganization of the General Electric Co.'s transformer division has been announced by W. V. O'Brien, manager of the central station divisions. The transformer division has been divided into two divisions as follows:

Transformer division, with responsibility for power and distribution transformers, feeder voltage regulators, lightning arresters, fuse cutouts, and capacitors. Harry F. McRell is appointed division manager.

Specialty transformer division, with responsibility for fluorescent lamp ballasts, specialty transformers, and products now the responsibility of the specialty transformer section. Paul M. Staehle is appointed division manager.

L. R. Brown, for 23 years manager of the transformer division in Pittsfield, Mass., has been assigned to Mr. O'Brien's staff, where his assignment will be manager of transformer divisions. Entering General Electric in 1903, Mr. Brown became the first transformer specialist under the late M. O. Troy in Schenectady. In 1910 he was made manager of distribution transformer sales, the position he held when the department was moved to Pittsfield in 1913. In 1923 he was made manager of the entire transformer division, succeeding Mr. Troy. Mr. Brown expects to maintain his headquarters at Pittsfield.

Mr. McRell joined General Electric in 1910 when he entered the G. E. test

ASSUME NEW DUTIES—Involved in the recent reorganization of General Electric's transformer division were L. R. Brown (left) and Harry F. McRell. Both Mr. Brown and Mr. McRell have long been identified with transformer division activities

More Utilities Join in 4-H Better Methods!

A STATE-WIDE Better Methods Program was recently launched in Indiana at a meeting attended by Arnold Hogan, President, and E. F. Hauser, Secretary of Indiana Electric Association . . . F. L. Hovde, President of Purdue University . . . H. J. Reed, Director, Agricultural Experiment Station . . . and other State Extension and utility representatives.

NOW . . . *EVERY UTILITY* in Indiana is participating in the 4-H Club Better Methods Electric Program!

DR. LOWELL S. HARDIN, Assistant Professor in Agricultural Economics, Purdue University, addresses 4-H Leaders on "The Need for Better Farm Methods" at Better Methods Clinic, sponsored by the *Public Service Company of Indiana.* At right, Walter C. Kolb, Assistant State 4-H Club Leader.

"THE NEED for Better Home Methods" was described at the Clinic by Miss Eva Goble, Home Economics Extension Specialist, Purdue University. Miss May A. Masten, Associate in 4-H Club Work, is at right.

More and more progressive *utilities are joining* the parade to 4-H Better Methods . . . to stimulate the *wider use* of electricity in rural areas. For example:

The Indiana Electric Association

representing utilities throughout Indiana, is sponsoring a *state-wide* Better Methods Program with awards of a *total value of $1275.*

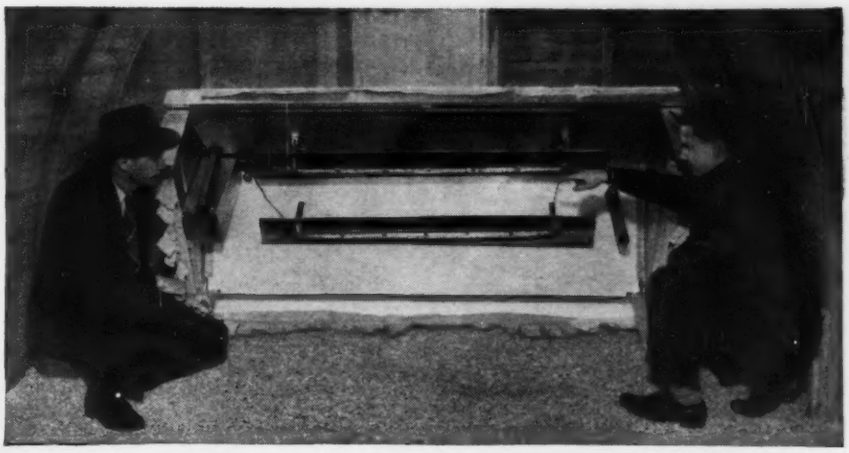
Eleven college scholarships will be given to 4-H boys and girls who do the best work in Better Methods Electric Projects. In addition, *$450 in cash prizes* will be awarded to the six County 4-H Club organizations that conduct the best Better Methods Programs during the year. Members of the Indiana Electric Association sponsoring these activities are:

Indiana & Michigan Electric Company
Indiana General Service Division of Indiana & Michigan Electric Company
Indiana Service Corporation
Indianapolis Power & Light Company
Madison Light & Power Company
Morresville Public Service Company
Northern Indiana Public Service Company
Public Service Company of Indiana, Inc.
Southeastern Indiana Power Company
Southern Indiana Gas & Electric Company

In Addition . . .

The Indianapolis Power & Light Company has conducted 4-H Club Programs for several years and, during 1946, will again award *more than $500* to 4-H boys and girls in *Marion County,* Indiana.

These awards will be made to 4-H Club Members who have carried on the best Better Methods Electric Projects – and to those who excel in Home Economics and Agricultural Demonstrations and Exhibits.



ADELINE ROY produces a luscious roast at 4-H Demonstration in Indianapolis Power & Light Auditorium. (Above) Paul D. Moffitt, 4-H Club Member, explains his farm-built electric chick brooder to Vo-Ag Teacher E. L. Callahan. Both youngsters are entered in the 1946 Better Methods Electric Contest.

YOU, too, are cordially invited to participate . . .

by tying-in your rural activities with this national program that is *right now* operating in your territory. There is nothing for you to *develop* or *originate* to identify your organization with the 4-H Club Better Methods Electric Contest in your rural territory.

FREE HELP for promoting YOUR OWN Better Methods Electric Program . . .

GUIDE BOOK – Explains Better Methods and how to apply them in simple, understandable language. Packed with factual information on farm and home jobs and chores.

REPORT FOLDER – Contains convenient blank forms for 4-H Club Members to develop and report their Better Methods Electric Projects.

LEAFLET – A complete explanation of each step of the Contest, also rules and regulations . . . for distribution to 4-H Club boys and girls.

POSTER – For display in your showroom windows in your farm territory – to establish them as information stations on the Electric Contest.

FARM BULLETINS – Twelve Bulletins on the many and varied uses of electricity on the farm and in the farm home.

IDEAS – Many useful suggestions to help you conduct your locally-sponsored Better Methods Electric Program.

Get started . . . now!

To start the Better Methods Electric Program working for you, send for the portfolio: "A Rural Community Service Program." In it you will find samples of the free material described above, and other helpful information. *Contact your nearest Westinghouse Office – or mail coupon, now!*

Tune in: JOHN CHARLES THOMAS – Sunday, 2:30 pm, EDT, NBC • TED MALONE – Mon., Wed. & Fri., 11:45 am, EDT, American Network

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

MAIL COUPON TODAY!

Rural Electrification Section (EW-6846)
Public Relations Department
Westinghouse Electric Corporation
Box 1017, Pittsburgh 30, Pennsylvania

Please send *free copy* of
"A Rural Community Service Program."

Name.....

Position.....

Company.....

Address.....

City.....Zone.....State.....

COULDN'T SLIP IF YOU TRIED TO!

It's the twisted bar that assures safe, sure footing, indoors or out . . . One-piece electroforged construction means rigid strength and minimum maintenance . . . Easy to install, and admits maximum light and air . . . Ideal during and after construction . . . Write for catalog . . .

BLAW-KNOX
ELECTROFORGED
STEEL STAIR TREADS
AND GRATING

BLAW-KNOX DIVISION of Blaw-Knox Company
2013 FARMERS BANK BUILDING
PITTSBURGH 22, PENNA.

course. He accompanied Mr. Brown to Pittsfield in 1913, and he has been continually identified with the activities of the transformer division since that time. In 1942 he became assistant manager of the transformer division.

Mr. Staehle entered G. E. test in 1912. The following year he entered the transformer engineering department at Pittsfield, Mass., and since that time has been closely associated with transformer engineering work.

•

Sylvania Appoints New General Sales Manager

B. K. Wickstrum has been appointed general sales manager of lighting products for Sylvania Electric Products Inc.

B. K. Wickstrum

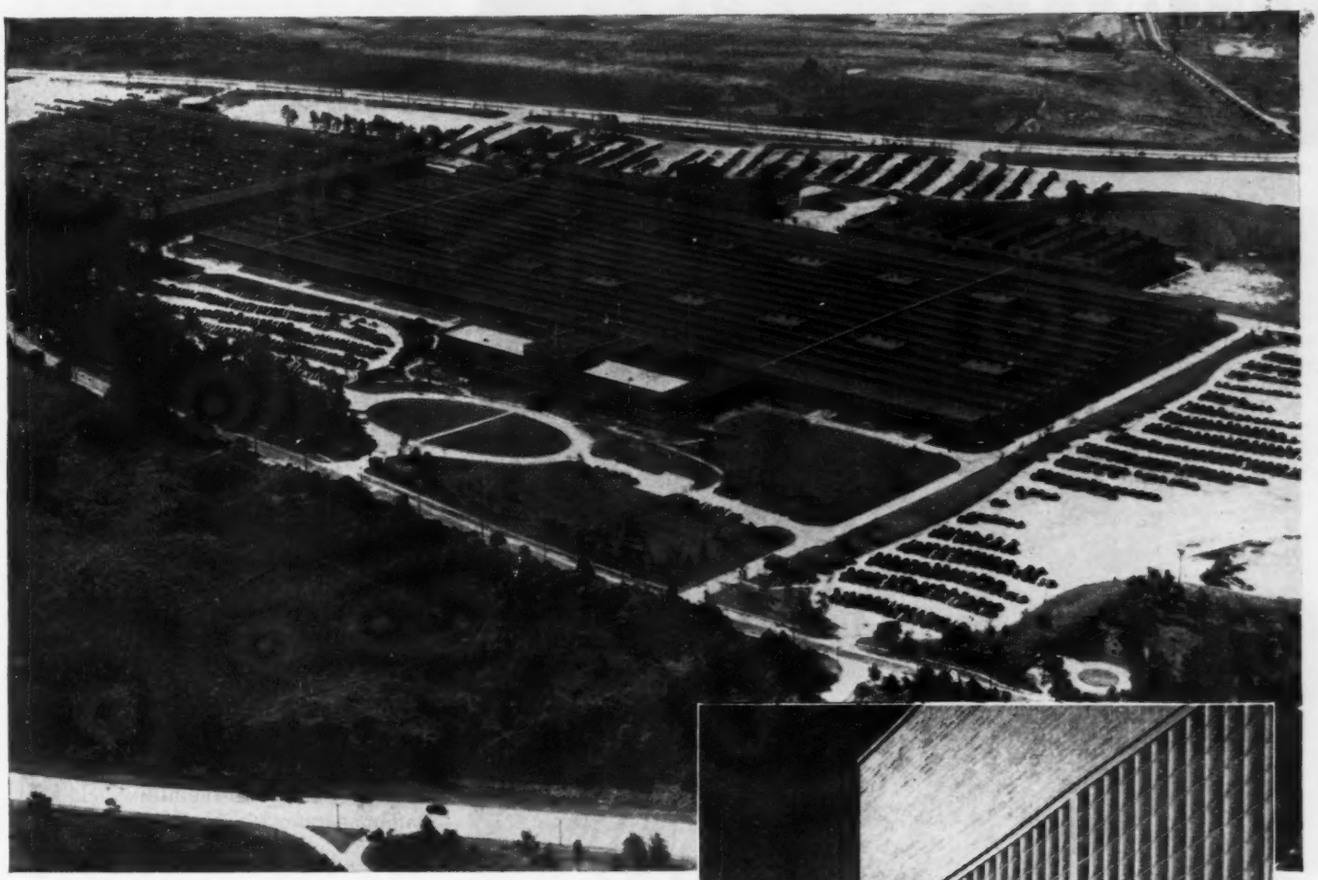
Mr. Wickstrum, who will make his headquarters in New York, will be responsible to Robert H. Bishop, director of sales, for the sale of incandescent and fluorescent lamps, fluorescent fixtures and wiring devices. Since joining Sylvania Electric in 1939, he has served as West Coast and Midwest sales manager and advertising and sales promotion manager of the lighting division.

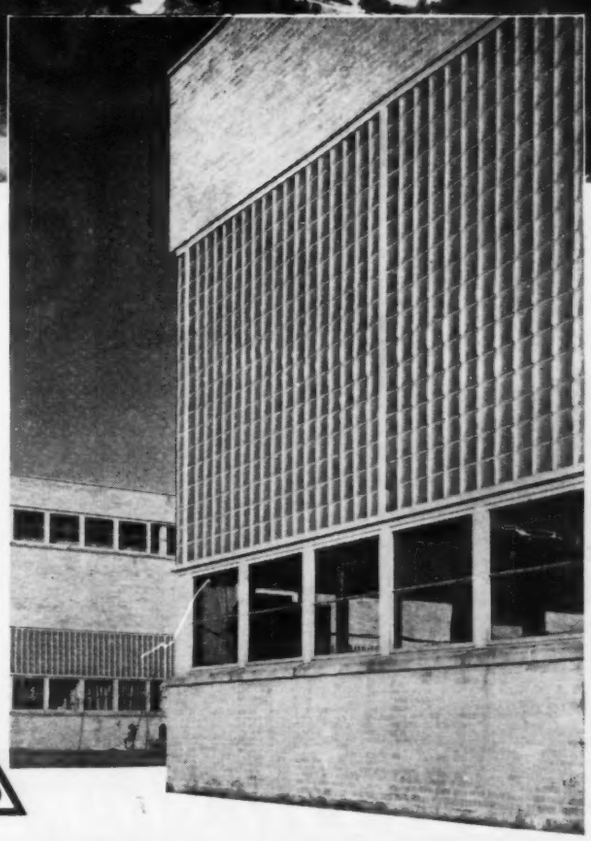
Mr. Wickstrum was affiliated with the Hearst newspapers and Advertising Almanac services before going to Sylvania Electric.

•

▶ Oscar H. Fogg, chairman of the executive committee of Consolidated Edison Co. of New York, Inc., since 1942, has just retired in accordance with retirement age rules of the company. He will continue as a member of the board of trustees. The position which he has held has been abolished by the company. Mr. Fogg entered upon his long career in the utility field with the United Gas Improvement Co. in Philadelphia. In 1904 he joined the Consolidated Gas Co. of New York. In 1924 he was elected vice-president in charge of commercial

WHERE THE BOMBSIGHTS GREW



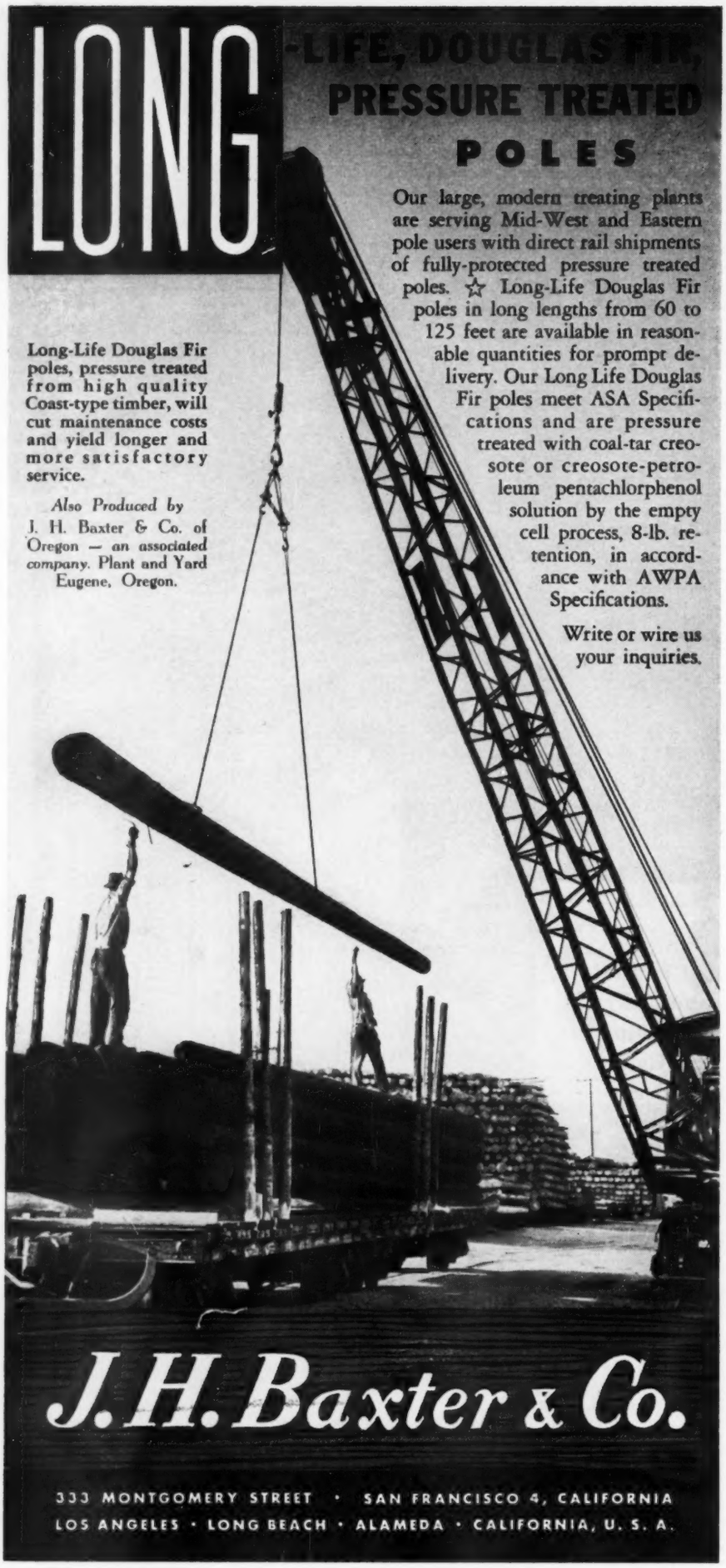


Utility and beauty are combined in the Nassau Plant where bombsights and other vital war precision instruments and equipment were manufactured by Sperry Gyroscope Co., Inc. The plant is modern and functional in design to assure maximum efficiency and comfortable working conditions.

Designed and built by Stone & Webster Engineering Corporation.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.


LONG-LIFE, DOUGLAS FIR, PRESSURE TREATED POLES
Our large, modern treating plants are serving Mid-West and Eastern pole users with direct rail shipments of fully-protected pressure treated poles. ☆ Long-Life Douglas Fir poles in long lengths from 60 to 125 feet are available in reasonable quantities for prompt delivery. Our Long Life Douglas Fir poles meet ASA Specifications and are pressure treated with coal-tar creosote or creosote-petroleum pentachlorphenol solution by the empty cell process, 8-lb. retention, in accordance with AWPA Specifications.
Write or wire us your inquiries.
Long-Life Douglas Fir poles, pressure treated from high quality Coast-type timber, will cut maintenance costs and yield longer and more satisfactory service.
Also Produced by J. H. Baxter & Co. of Oregon — an associated company. Plant and Yard Eugene, Oregon.
J.H. Baxter & Co.
333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA
LOS ANGELES · LONG BEACH · ALAMEDA · CALIFORNIA, U. S. A.

relations, customer's service and utilization and in 1935, executive vice-president. In 1937, following mergers of several of the electric and gas companies in the system and the change of name to Consolidated Edison Co., he was elected vice-chairman of the board. He was made chairman of the executive committee of the company in 1942. Mr. Fogg is a past-president of the American Gas Association.

▶ J. L. Shearer of Wake Forest, N. C., has been elected president of the North Carolina Rural Electric Cooperative Association.

▶ A. D. Cameron, who has been associated with the Holophane Co. since 1931, in the capacity of vice-president and a member of the board of directors, has just retired. Mr. Cameron has completed 36 years in the lighting field. He entered General Electric Co. street lighting department in 1910, subsequently becoming manager. During World War I he was executive officer, radio division, Signal Corps, and saw service both in this country and in France. Active in the Illuminating Engineering Society for a number of years, he was elected president of that society in 1940.

▶ Charles D. Spencer, Central Maine Power district agent at South Berwick, Me., since 1938, has retired from active service. He entered the utility field as a station operator with the Malden (Mass.) Electric Co. in 1907 and four years later went to Vermont, where he became interested in hydroelectric operation and development. In 1932 he was appointed manager of the Rutland division of the Central Vermont Public Service Corp., and was transferred to the Central Maine Power system in 1934, with headquarters at Westbrook.

▶ John K. Walter has been appointed supervisor of training for the operating department of West Penn Power Co., Pittsburgh. Mr. Walter has been with the company for twelve years and before entering military service was assistant to P. H. Powers, vice-president.

▶ Wilbert L. Miller, publications director of the New England Power Service Co., Boston, and chairman of the editorial board of *Contact*, the System's magazine, was elected president of the National Council of Industrial Editors at the fifth annual convention of that body, which was recently held in the Bay State capital.

▶ Campbell Wood has been appointed works manager of Nash-Kelvinator Corp.'s Pacific Coast plant at El Segundo, Calif. Supplementing the company's facilities in Michigan and Wisconsin, the plant,

First Choice on every count

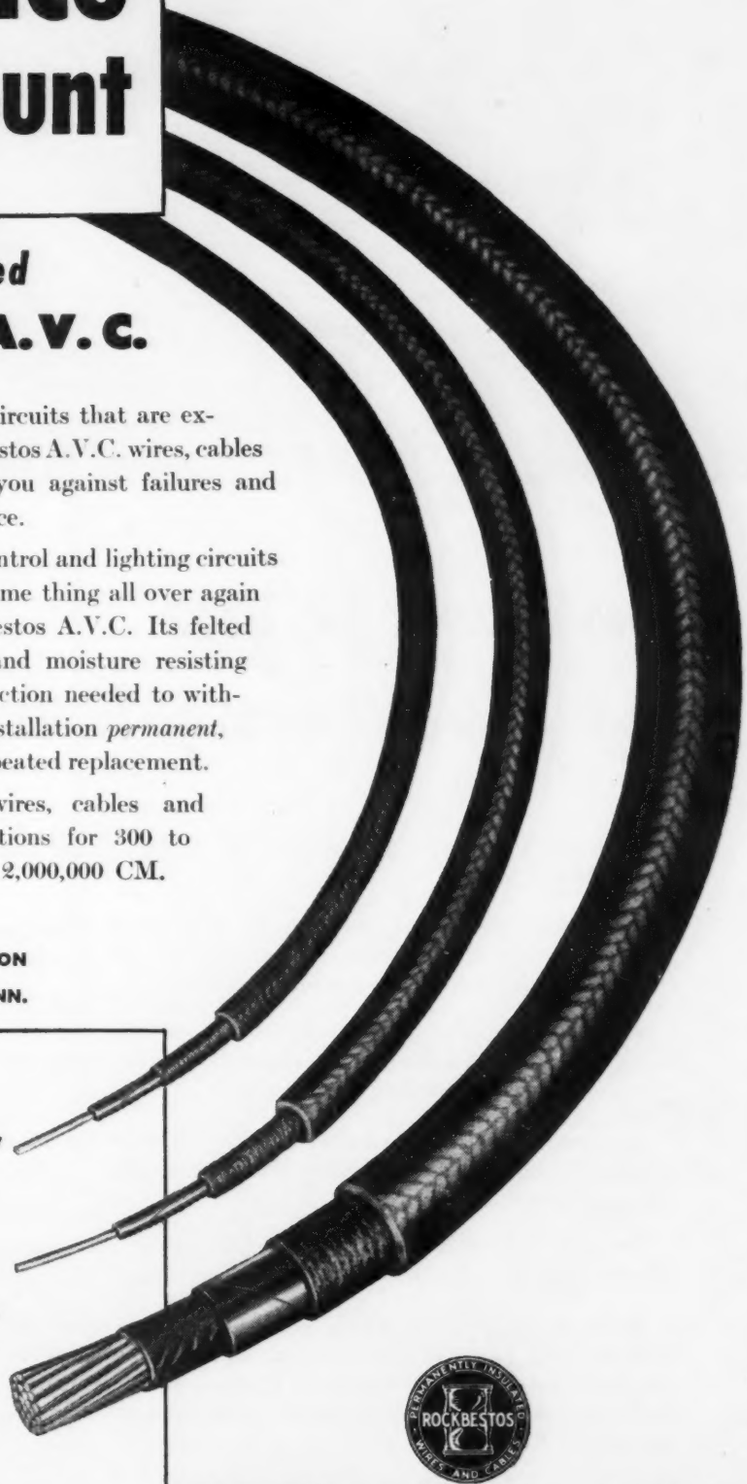
Permanently Insulated ROCKBESTOS A.V.C.

There are 9 good reasons why you should wire circuits that are exposed to severe operating conditions with Rockbestos A.V.C. wires, cables and cords . . . and they all combine to *insure* you against failures and practically eliminate expensive circuit maintenance.

You won't have to pull out and replace power, control and lighting circuits that are failing too often . . . and then do the same thing all over again . . . if you rewire with *asbestos insulated* Rockbestos A.V.C. Its felted asbestos walls, impregnated with heat, flame and moisture resisting compounds, are built to give you the *extra* protection needed to withstand conditions that ruin wire. They make an installation *permanent*, protect circuit operation and save the cost of repeated replacement.

These *permanently insulated* money-saving wires, cables and cords are made in a wide variety of constructions for 300 to 5000 volt service . . . in sizes No. 18 AWG to 2,000,000 CM. For complete data write for a catalog.

ROCKBESTOS PRODUCTS CORPORATION
141 NICOLL ST., NEW HAVEN 4, CONN.



1. **Won't age or deteriorate**
2. **Won't bake brittle, crack or flow under heat**
3. **Won't burn or carry flame**
4. **Corrosive fumes won't rot it**
5. **Remains permanently flexible**
6. **Resists oil, grease and moisture**
7. **Withstands conductor-heating overloads**
8. **Gives greater current carrying capacity**
9. **Reduces circuit maintenance expense**

These characteristics are built into 125 Rockbestos constructions including the wires illustrated:

Rockbestos A.V.C. 600 Volt Switchboard Wire.
Rockbestos A.V.C. 600 Volt Boiler Room Wire.
Rockbestos A.V.C. 600 Volt Power Cable.

ROCKBESTOS A.V.C.
The Wire with Permanent Insulation

NEW YORK BUFFALO CLEVELAND CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES
SAN FRANCICSO SEATTLE PORTLAND, ORE.

Goes to work for you when your customers go to sleep

Here it is! The new G-E Automatic Blanket builds up your load in the darkest hours!

This "electrically-warm" Blanket works for you from midnight to morning—just when you need the load most. *Two* G-E Blankets equal one six-foot refrigerator in energy consumption.

Introduced by General Electric before the war, these wonder-Blankets are newly lightweight, warm, and soft—the marvelous result of tremendous wartime research and use.

Your customers have been reading about G-E Blankets for many months. In top-circulation magazines like *Life, Good Housekeeping, House Beautiful,* and *This Week.*

And they've been hearing about G-E Blankets on the radio—via the lively new-idea show, "The G-E House Party."

Write us today for full information—find out how others are exploiting this new load "builder." Ask us for your copy of the promotion package, "G-E Automatic Blankets Are Here Again." General Electric Company, Appliance and Merchandise Dept., Bridgeport, Conn.

Automatic Blanket

"Goes to work when the lights go out"

GENERAL ELECTRIC

purchased from the War Assets Corp., is expected to be in operation on the assembly of Nash cars by late fall. Mr. Wood, who has been with Nash-Kelvinator since 1925 in various executive positions, until recently was general manager of the corporation's war-time aircraft propeller division. He will open offices in Los Angeles in the near future.

▶ JOHN E. DUGAN, industrial service consultant and commercial cooking specialist, has been appointed commercial utilization representative for the Bonneville Power Administration.

▶ A. C. SCHWAGER, formerly vice-president and chief engineer of the Pacific Electric Manufacturing Corp., San Francisco, has been made president of the recently incorporated Schwager-Wood Corp., Portland, Ore., specializing in the manufacture of high-voltage airbreak switches.

▶ WILLIAM BALDERSTON, vice-president in charge of operations for the past two years, has been elected executive vice-president of the Philco Corp. Mr. Balderston joined Philco in 1930. Two years ago he was named vice-president in charge of operations and has been responsible for the conclusion of the company's war work and the reconversion and expansion of its facilities to meet peace-time requirements.

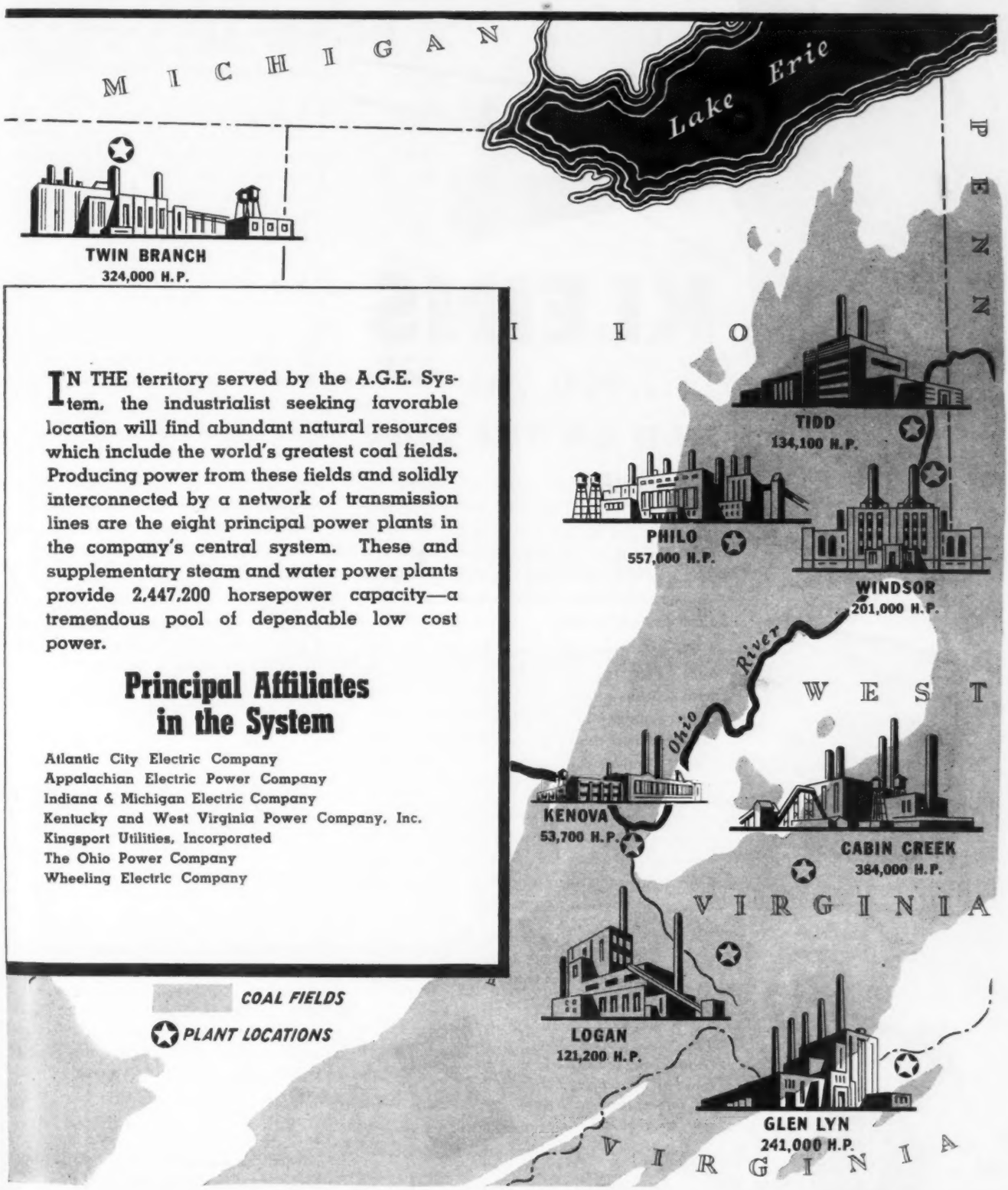
▶ DAVID LEWIS has been elected a vice-president of Refrigeration Corp. of America. Mr. Lewis will be in charge of the management and operation of Refrigeration Corp.'s plant in Perth Amboy, N. J., recently acquired by the company. During the past four years, Mr. Lewis was assistant to the president of the T. J. Baker Chemical Co., Phillipsburg, N. J.

▶ DAN E. DUNNE has been appointed sales manager of Lighting Products Inc., Highland Park, Ill. Prior to the war, Mr. Dunne represented Chase Brass & Copper Co. and Edwin F. Guth Co. in the Chicago territory.

▶ GEORGE E. SANGSTER has been appointed sales research engineer for the Sangamo Electric Co., Springfield, Ill. Mr. Sangster was recently released from the Navy with the rank of lieutenant, following two and one-half years' service. He was formerly with the Potomac Electric Power Co., Washington, D. C.

▶ A. G. GRIER, manager, distribution equipment division, Canadian General Electric Co., Ltd., Toronto, Ont., has retired. Early in his career Mr. Grier was associated for short periods with the Stanley Electric Co., Western Electric Co., Allis-Chalmers Manufacturing Co.

HERE'S POWER FOR INDUSTRY

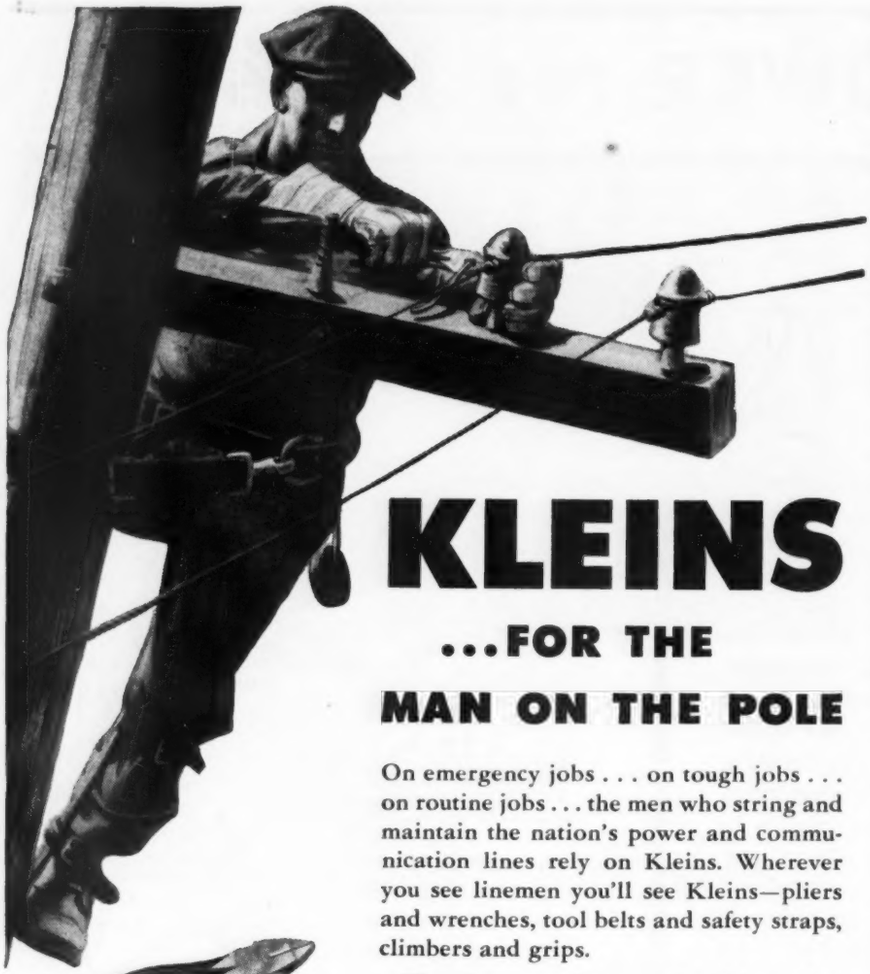


IN THE territory served by the A.G.E. System, the industrialist seeking favorable location will find abundant natural resources which include the world's greatest coal fields. Producing power from these fields and solidly interconnected by a network of transmission lines are the eight principal power plants in the company's central system. These and supplementary steam and water power plants provide 2,447,200 horsepower capacity—a tremendous pool of dependable low cost power.

Principal Affiliates in the System

Atlantic City Electric Company
Appalachian Electric Power Company
Indiana & Michigan Electric Company
Kentucky and West Virginia Power Company, Inc.
Kingsport Utilities, Incorporated
The Ohio Power Company
Wheeling Electric Company

American Gas and Electric Service Corporation



KLEINS
...FOR THE MAN ON THE POLE

On emergency jobs . . . on tough jobs . . . on routine jobs . . . the men who string and maintain the nation's power and communication lines rely on Kleins. Wherever you see linemen you'll see Kleins—pliers and wrenches, tool belts and safety straps, climbers and grips.

There's a sound reason for this preference. For linemen and electricians—men who know good tools—also know of the quality materials and expert craftsmanship that go into every piece of Klein equipment. To them this excellence means safety, efficiency, speed . . . on every job.

Today Klein is in production on its complete line of quality equipment. Of course, demand still exceeds supply—but your supplier will furnish the Klein equipment you need just as soon as possible.

Klein Pliers

Klein-Kord Tool Belts

Klein-Kord Safety Straps

Klein Climbers

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

The Klein Pocket Tool Guide showing the Klein line and containing useful information will be sent on request.

Since 1857

Mathias KLEIN & Sons

Established 1857 — **Chicago, Ill., U.S.A.**

3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

in the United States and the Royal Electric Co. of Montreal. In 1906 he became partner in the firm of Wescott and Grier, Montreal, and from 1911 to 1919 practiced engineering in Peterboro, Ont. He joined the Canadian General Electric Co., Peterboro, in 1920 as assistant to the general superintendent. In 1926 Mr. Grier was named distribution engineer.

▶ WILLIAM L. JENKINS has been appointed manager of the recently created electronic applications development department of the B. F. Goodrich Co., Akron, Ohio. Mr. Jenkins joined the company in 1940 and for the last several years had been an experimental engineer.

▶ R. M. WILSON, JR., has joined the technical service section of the development and research division of the International Nickel Co., Inc., at New York, as welding engineer. He was formerly welding engineer at the Bloomfield, N. J., works of the General Electric Co. Mr. Wilson is chairman of the New Jersey section of the American Welding Society.

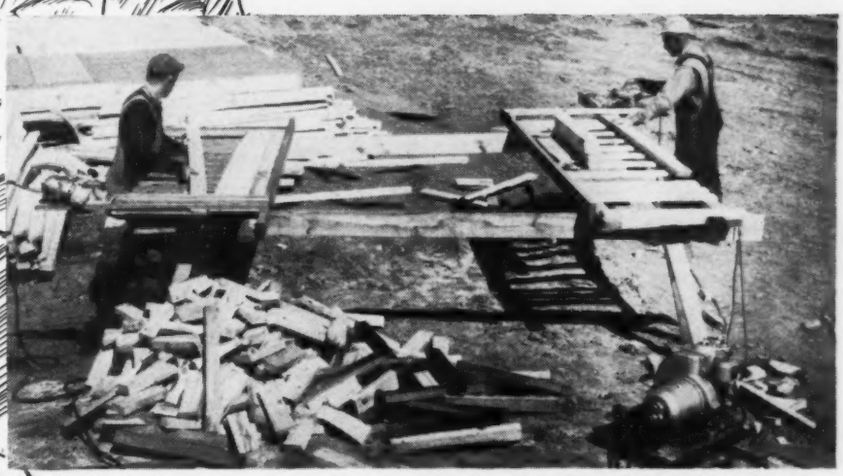
▶ J. M. BENNAN has returned to the Jefferson Electric Co., Bellwood, Ill., after two years service in the Navy. Mr. Bennan has been appointed vice-president-secretary and has been assigned to other corporate executive duties. In his new position he will not be completely divorced from the sales department, but will continue to act in an advisory capacity. R. A. HOAGLAND, who served as acting sales manager for the company during Mr. Bennan's absence, has now been made vice-president and general sales manager.

▶ FRED J. VORLANDER has been appointed to head the lamp and lighting application activities of the Champion Lamp Works, Lynn, Mass. Mr. Vorlander has been active in the lighting industry since 1929. From 1929 to 1942 he served as lighting service engineer, then as application and sales promotion engineer with the Philadelphia Electric Co. In 1941 he was co-winner of the Curtis Award. Since 1942 he has been with the Bureau of Ships, Navy Department, Washington, D. C., as a civilian electrical engineer and head of the aircraft carrier lighting and power application engineers.

▶ G. K. THORNTON has been appointed advertising manager of the Scoville Manufacturing Co., Waterbury, Conn.

▶ LT. STANLEY E. WOLKENHEIM, U. S. Navy, has been appointed sales manager, water heater sales division, Edison General Electric Appliance Co. Before entering the Navy in 1941, he was with the

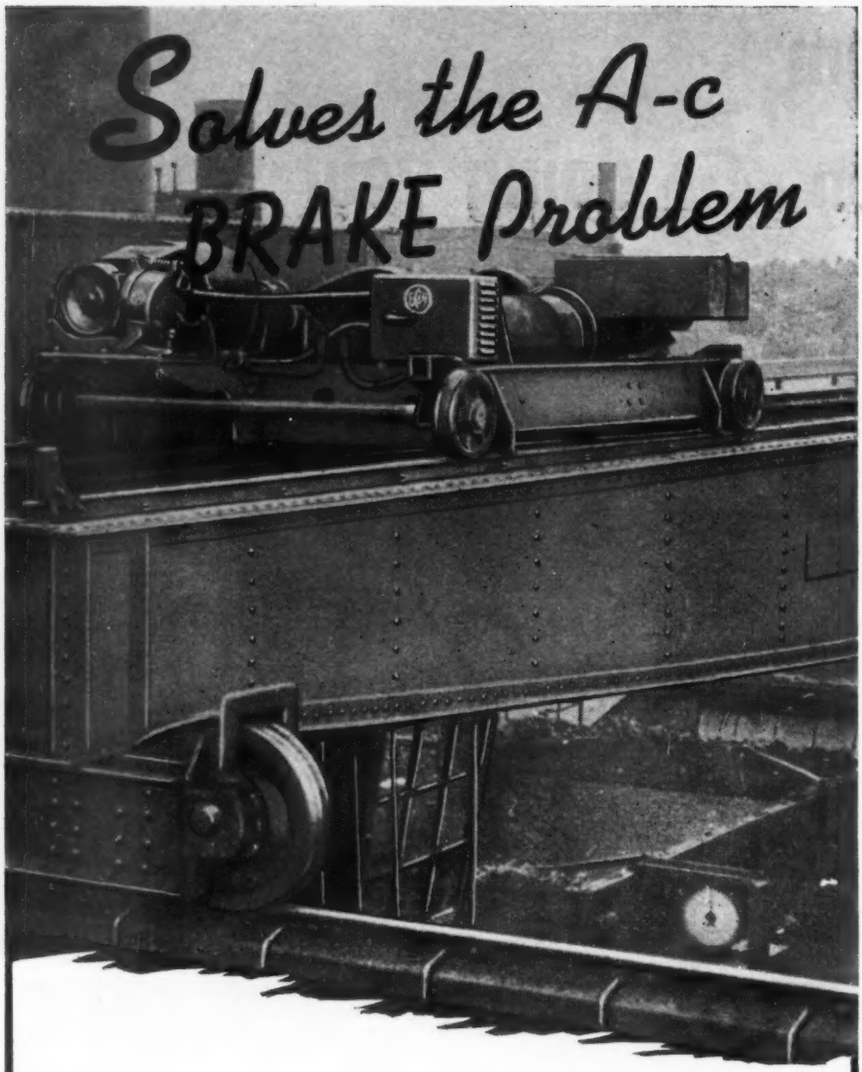
See them in action doing your work on your job



See how men work faster with electric tools operated by Homelite Portable generators. Test the capacity, speedy priming and operational advantages of Homelite Pumps on your toughest dewatering job.

There's only one real way to see how well a Homelite Pump handles large volumes, seepage, mud . . . or how easily a Homelite Generator supplies steady current for floodlights, cost-cutting electric tools, communication systems, etc. That way is to get 'em out on the job. Yes, get these handy portable gasoline-engine-driven units out on *your* job and see how they measure up to *your* standards. See how they work for *you.* All you have to do to get a free demonstration . . . the only way to see in advance what you should get for your money . . . is to write to us today. We'll arrange to have a Homelite Representative see you soon.

Homelite
CORPORATION
Port Chester, New York
Portable Pumps Generators and Blowers
GASOLINE-ENGINE-DRIVEN



THIS EC&M TYPE WB BRAKE replaced an a-c brake on this 40 HP wound-rotor crane-hoist motor. The rectifier-unit for operation of this shunt-wound WB Brake from a-c power is shown at the right in its compact, ventilated enclosure.

The previous brake required renewal of brake linings as often as twice a week and frequent inspection to keep the brake in adjustment. In nearly six months service, the WB Brake Blocks have shown very little wear and the Brake has operated with minimum attention.

These Type WB Brakes not only eliminate the laminated members required in a-c brake design, but give quick response. High initial current insures *fast release;* automatic reduction in holding current results in *fast setting*.

Many users of a-c motor-driven cranes, hoists and machines are switching to the EC&M Type WB Brake with rectifier unit for improved performance and lower maintenance. Write today for your copy of Bulletin 1006 describing the many advantages of this better brake for a-c circuits.

EC&M TYPE WB BRAKES give—
HIGH SPEED PERFORMANCE—REDUCED UPKEEP!

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

company in the treasury department and as manager of the company's Buffalo, N. Y., branch.

► ARNOLD E. BROCK has been appointed manager of the circuit breaker engineering division of the Pacific Electric Manufacturing Corp., San Francisco and RICHARD F. GIBBONS manager of the air breaker engineering division.

► NELSON P. CASE, formerly chief engineer of the receiver division of The Hallicrafters Co., Chicago, has been appointed chief engineer for the entire Hallicrafters organization. Promotion of FRITZ FRANKE, formerly chief engineer in charge of research and design, to assistant sales manager has also been announced.

OBITUARY

► V. J. GIRARDIN of Dallas, Tex., southwestern district sales manager of Landers, Frary & Clark, died at his home in that city on April 20. Mr. Girardin had been connected with Landers, Frary & Clark for ten years.

► BENJAMIN P. B. TEST, designer and authority on electric and gas furnaces, died at his home near Cleveland on May 25. He was 66 years of age. A native of Salem, N. J., Mr. Test was employed for eight years immediately following World War I by the General Electric Co., designing alloy melting furnaces. Since that time he operated his own consulting engineering business in Cleveland.

► JAMES FLOYD DENISON, 79, died at Orange, Calif., on May 13. Formerly secretary-treasurer for Montana Power Co. from 1925 until 1932 at Butte, Mont., Mr. Denison had retired to California to live. His association with Montana Power had dated from 1910. He had received his education at Brown University and Columbia University law school.

► CHARLES R. HEPNER, electrical engineer for the Willard Storage Battery Co., Cleveland, for the past 20 years, died at his home in that city on May 25 following a long illness.

► WILLIAM VAN BOKKELEN, consulting electrical engineer, died May 22 at Berkeley, Calif. He was 60 years of age. A graduate of the University of California, Mr. Van Bokkelen was for many years chief engineer of the Coast Counties Gas & Electric Co. In 1939 he headed the electrical department for the Golden Gate International Exposition, and subsequently had maintained consulting electrical engineering offices in San Francisco.

What Makes A Mailing Click?

● *Advertising men agree —the list is more than half the story.*

McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power. They offer thorough horizontal and vertical coverage of major markets, including new personnel and plants. Selections may be made to fit your own special requirements.

New names are added to every McGraw-Hill list daily. List revisions are made on a twenty-four hour basis. And all names are guaranteed accurate within two per cent.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Ask for more detailed information today. You'll probably be surprised at the low over-all cost and the tested effectiveness of these hand-picked selections.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 WEST 42nd ST.
NEW YORK 18, N. Y.

10 G-E FUSE FEATURES

THAT ALWAYS SPELL P·R·O·T·E·C·T·I·O·N

PYREX* top resists heat, and has magnifying lens window for easy reading of rating.

RIVET for contact at fuse base carries fuse rating for additional identification.

ONE end of fuse link is soldered securely to shell and the other is firmly soldered to the contact rivet.

THE shell, holding Pyrex top and cold-molded base together has a metal coating to minimize oxidation of shells.

EACH shell is staked securely into the base, preventing disassembly of blown fuse.

COLD-MOLDED base is sturdy and heat-resistant, and will withstand greater shocks than bases made of other materials.

THE G.E. on the top is your assurance of quality and reliability in every Pyrex fuse.

INDICATION is positive through either round or hexagonal window. Blown fuses show clearly.

ON-THE-SPOT dispenser cartons help consumers to store fuses in readily available locations.

NOTE the Underwriters' Laboratories Inc. label on every G-E Pyrex fuse.

. . . FOR BRANCH CIRCUITS

For information, see your nearest G-E Merchandise Distributor, or write to Section D668-9, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

**Trade-Mark Reg. U. S. Pat. Office*

GENERAL ELECTRIC

MANUFACTURERS & MARKETS

Workers Participation Plan Established by Fowler

Employees Gain by Maintaining Product Standards As Well As Increasing Plant Productivity

An employee participation plan which is expected to increase production, maintain a high standard of finished product, and benefit all plant workers with increased returns has recently been put into operation by Fowler Manufacturing Co., Portland, Ore.

Paul L. Fowler, president of the company, in explaining the plan, stated that:

1. For each water heater leaving the production line, 50 cents is added to a special fund by the company.
2. For each new porcelain range boiler the company adds an additional 15 cents.
3. One percent of the gross billing of the porcelain and paint job work done by the company also is contributed to the fund.

In order to provide a high degree of workmanship, a deduction system has been incorporated into the plan. Any heater sold which must later be replaced free of charge will cost the fund $1.00 per heater. Range boilers falling in the same category will bring a 30 cent deduction. In no case will a deduction be made from the employee's personal earned wages.

The fund operates solely as an "above wage" earning. At the end of the year the remaining funds are distributed to employees on a percentage basis. A $10,000 fund on a $200,000 payroll would bring the employee a 5 percent addition to his earned wage for the year.

Rules and regulations covering the plan state that personnel dismissed for cause will not participate but any person laid off for reasons beyond his or the company's control will participate up to the time of pay termination. A continuous report of production, addition to the fund, and the payroll percentage is posted weekly on the plant bulletin boards.

•

Cable Electric in Merger

Cable Electric Products, Inc., Brooklyn, has absorbed its wholly owned subsidiary, Marks Products Co., Inc. The merged companies will continue to manufacture the "Snapit" line of electrical wiring devices and door chimes. At the same time the company declared a special dividend of ten cents per share, payable June 15 to stockholders of record June 1.

•

Electric Toaster Price Increase Allowed by OPA

OPA has granted manufacturers of small electrical appliances a "wage-price increase" of 9.3 percent. This amount may be added to the 8 percent reconversion price increase granted last fall, according to OPA. It will result in raising present retail prices by from 4 to 5 percent.

Among appliances covered by the increases are toasters, warming pads and small space heaters.

"Branded" articles customarily selling at uniform retail prices across the country will be priced exactly 5 percent higher than their present ceilings, the OPA stated.

Alcoa Announces Plans for $30,000,000 Plant

Aluminum Co. of America recently announced plans to construct a new plant for the rolling of aluminum sheet and plate at Davenport, Iowa, which will cost an estimated $30,000,000. One of the largest plants in the Alcoa chain, the Davenport plant will have an output of 10,000,000 lb. per month and will occupy a tract of nearly 500 acres. The plant itself will have a floor area of 43 acres, it is stated, and will employ approximately 2,000 people.

Completion of the plant, which has been hailed as the largest announced for construction in the United States in the post-war period, will begin within a month and will require 18 months to build, it has been stated.

Selection of the site for the new plant was announced by Thomas D. Jolly, vice-president and chief engineer of the Aluminum Co. of America.

This new rolling mill will be the largest

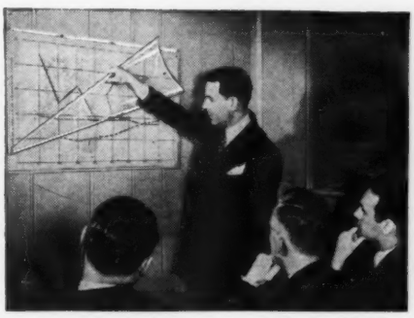
STUDY ALCOA PLANT PLANS—Studying map of new $30,000,000 rolling mill of the Aluminum Co. of America to be built at Davenport, Iowa, are: (left to right) Thomas D. Jolly, vice-president and chief engineer of Aluminum Co. of America; Mel Foster, Davenport civic leader and realtor, and George A. Uhlmeyer, head of the industrial engineering department, Iowa-Illinois Gas & Electric Co., Rock Island. Mel Foster acquired the land for the plant site. Mr. Uhlmeyer's department worked with ALCOA on surveys that led to selection of the Davenport site over six others

You may be using 4 different processes to do these 4 jobs! { Ozalid does them all in seconds!

WHEN you adopt Ozalid, you can consolidate your reproduction work . . . turning out prints for your entire organization—all in the same simple manner—with the greatest speed and economy.

1. Use Ozalid to reproduce engineering drawings or other translucent originals . . . as easier-to-read, positive copies . . . with lines and images in the color you prefer—black, blue, red, or sepia . . . and on the material you prefer—paper, cloth, foil, or film. You'll appreciate this choice, for you can always make the type of print best fitted for the job at hand. For example, an Ozalid Sepia-line Intermediate print allows you to eliminate re-drafting when making design changes.

2. Use Ozalid to prepare dignified form letters that exactly match original typing. Simply type the basic message on a translucent letterhead and make OZALID BLACK-LINE PRINTS. On these, type in headings and personal references. No one will know the difference . . . but you cut time and labor costs to a fraction and keep up to date!



3. Use Ozalid to produce transparent film overlays in different colors for dramatic, readily understood presentations of products, facts, or services. Prohibitively expensive with any other method, this simple with OZALID: Draw separate units on individual sheets of translucent paper . . . and reproduce each on an Ozachrome film of desired color. Then merely overlay in register.

4. Use Ozalid to copy photographic material—in truly amazing fashion—in seconds, without darkroom restrictions. OZALID DRYPHOTOS have full tonal values, are delivered dry, ready for immediate use in sales catalogs, displays, etc.!

Available now—Ozalid machines for large, medium, and occasional production requirements. Whichever model you choose, you have the *same* versatility.

See the 10 types of prints you can make with Ozalid . . . and learn all about this new graphic art everyone can use.

***Write* today for free booklet No. 115.**

OZALID

Division of
GENERAL ANILINE AND FILM CORPORATION
JOHNSON CITY, NEW YORK

Ozalid in Canada—Hughes Owens Co., Ltd., Montreal

power user in Iowa when completed, according to George A. Uhlmeyer, head of the industrial department of Iowa-Illinois Gas & Electric, who directed surveys and studies that helped satisfy the Aluminum Co. that the Davenport area afforded the desired advantages. Power consumption, he said, will be greater than that of any plant now served by the utility in the Quad-City area or elsewhere. It was indicated that this new industrial development will necessitate a major expansion of facilities at the Riverside plant of Iowa-Illinois Gas & Electric Co., located about a mile from the site of the new plant.

•

Manufacturers Make Plans for Plant Expansion

Among the electrical manufacturing companies that have recently announced plans to expand plant output are the following:

Cornell-Dubilier Electric Corp. recently purchased an eight-story building in Worcester, Mass., three floors of which it had leased for the duration of the war to produce condensers required for the proximity fuse. The company will also purchase the plant's machinery and equipment, most of which is owned by the Navy.

The plant is located at 6-22 Grafton St. The corporation has also leased two floors of a large plant at 55 Cromwell St., Providence, R. I. This new manufacturing space, comprising 26,000 sq. ft., will be used as a feeder, producing subassemblies for the company's other factories.

Apex Electrical Manufacturing Co., with sales for 1945 of $22,960,393, a gain of 70 percent over 1944 for a new peak, is working out an expansion and improvement program which will provide a 50 percent increase in capacity for production. This manufacturer will have in Cleveland and Sandusky 520,000 sq. ft. of manufacturing floor space, according to C. G. Frantz, president.

As a step in its expansion into the electronic and electrical products field, the McQuay-Norris Manufacturing Co. has purchased the buildings and equipment of L. M. Persons Corp. and Southern Electronics Co., both of St. Louis, Mo. These companies will be known as the Electric Products Division of McQuay-Norris. L. M. Persons and other personnel will remain with the division.

Opening of a new Cleveland office of the General Detroit Corp. and the General Pacific Corp. is announced by E. A. Warren, vice-president in charge of sales. The office, located at 912 Park Building, will be under the supervision of Scott E. Collins, the new zone sales manager.

Public Receives Rights To New High-Temp. Steel

Is a Carbon-Molybdenum Chromium Composition Steel Which Resists Graphitization up to 1,100 Deg. F.

All patent rights to the use of a "stabilized" steel composition designed to meet requirements of increasingly high temperatures in the steam lines of power plants and in the chemical industry have been dedicated to public use by United States Steel Corp. of Delaware and Carnegie-Illinois Steel Corp. The patent, issued recently, relates to "the use of a grade of steel particularly resistant to graphitization when subjected to stress in the temperature range from 800 deg. to 1,100 deg. F." According to the patent, the steel developed and specified for this service is a carbon-molybdenum-chromium composition.

"Formerly plain carbon-molybdenum steel was considered completely safe for use in stress at temperatures up to about 1,100 deg. F. since it was known to have adequate creep strength within this range," according to the wording of United States patent No. 2,359,043, which describes the composition of the steel. "Recently, however, it has been found that with prolonged use at elevated temperatures the carbon in the steel graphitizes so as to produce planes of weakness. . . . It is believed that this effect might prevail at temperatures as low as 850 deg. F. with adequate time, and it has been found definitely present at temperatures above 900 deg. F." it continues.

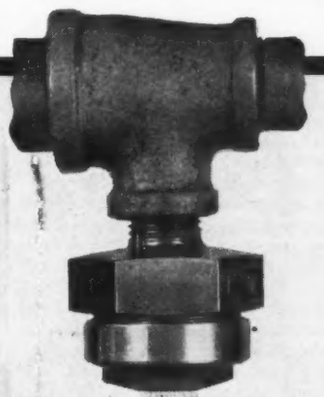
At first, where conditions required a change from plain carbon-molybdenum steel it was common to use a more expensive material containing 1 percent or more of chromium, but it was found that chromium in such quantities considerably increased the cost of the steel and detracted somewhat from its creep strength. The use of the small amount of chromium in the recent patented invention involves a steel which is both practical and economical since the small additional cost is offset by greater service life, United States Steel Corp. reports. Further advantages are that the amount of chromium used does not materially affect creep strength, which remains approximately the same as that of the conventional carbon-molybdenum type, or may even provide improved creep strength, and since the small amount of chromium does not make the steel air-hardening, it can be handled and processed in the usual manner, according to the report of the corporation.

The steel embraced in the patent now made available to public use is of the pearlitic, non-air-hardening type containing from 0.08 to 0.20 percent carbon and from 0.45 to 0.65 percent molybdenum in conjunction with from 0.15 to less than 1 percent chromium, which is proportioned with respect to the carbon content to fix substantially all the carbon in the form of carbide, which is stable within the defined temperature range, Dr. Grossmann, one of the inventors, said in describing the material.

PRODUCTION ROLLING—An output of 200 Airtopia reverse cycle heating and cooling units has been attained at the Los Angeles plant of Drayer-Hanson, Inc. There are two production lines turning out these new post-war designs. Illustrated is the assembly line with the 300 series going through. The same production line is used for the 500 series; the second handles the 750 and 1,000 series

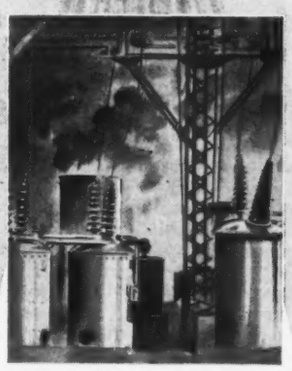
Presenting

THE NEW
BLAW-KNOX
AQUATOMIC
FOG NOZZLE
FOR BETTER
FIRE PROTECTION



Ideal for fixed sprinkler installations—the new Blaw-Knox Aquatomic Nozzle *blankets, cools* and *quenches*—free flowing and non-clogging—maintains pattern at reduced pressures—a real advance in nozzle design.

Consultation Invited



BLAW-KNOX
SPRINKLER DIVISION
829 Beaver Ave.
Pittsburgh 12, Pa.
Offices in Principal Cities

Contest Offers Cash For Welding Applications

A total of $2,000 in prizes will be awarded the winning papers on original work which extends the application of resistance welding, in a competition conducted by the Resistance Welder Manufacturers Association.

The contest, which closes July 31, 1946, offers a first prize of $750 for the best paper from an industrial source, a consulting engineer or a private or government laboratory, which describes original work done by the author or under his supervision on any aspect of resistance welding, such as product design, fabrication procedure, or research. Papers should include information on cost savings, production improvement, scope of application, etc.

Additional prizes of $500 and $250 will be awarded the second and third best papers. A first prize of $300 and a second prize of $200 will be given the best papers from university sources.

Judges for the contest, five in number, will be appointed by the American Welding Society. Papers should be typed, double spaced, on one side of the paper, and sent to the American Welding Society, 33 West 39th St., New York City 18. If submitted prior to July 1, three copies of the manuscript should be furnished; if filed between July 1 and 31, six copies must be furnished.

•

McHugh Products Formed; Succeeds Slater Elec. Co.

McHugh Products, manufacturer of "Utility" incandescent street lighting lamps, has been formed as successor to Slater Electric & Mfg. Co. John J. McHugh, partner, and director of sales of the former company, has acquired full ownership and will continue his duties in charge of sales. Engineering research, development and production management will continue under the direction of E. B. Saul.

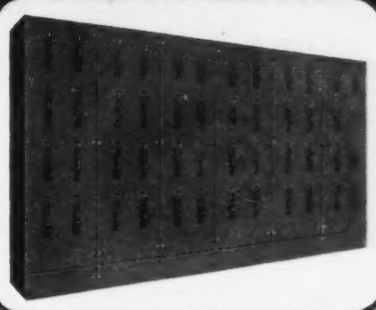
Manufacturing facilities, which have been enlarged and modernized with the latest type machines and equipment to meet war-time demands will be expanded for post-war requirements in the same plant at 728-736 Atlantic Avenue, Brooklyn, N. Y.

•

Organizes Sales Agency

William Kremer, formerly appliance manager for the Philadelphia Electric Co., has established his own manufacturer's sales agency, William Kremer Co., Inc., Architect's Building, Philadelphia 3, Pa. The agency will cover the Middle Atlantic states, providing sales and merchandising service.

You're sure that it meets EVERY REQUIREMENT~



when~
your Switchboard is produced by
•Pelham

We take full responsibility for meeting all specifications of architects and engineers . . . as well as municipal, state and federal requirements. You are completely relieved of all such detail work when your switchboard is designed and built by Pelham.

Exceptional Engineering Service. No matter how difficult your problems of design may be, our engineering department has probably met and solved them, in our wide experience.

Nothing but Highest Quality. All Pelham equipment is built with the best of materials and workmanship.

Dependable Service. Our deliveries are made when promised.

PELHAM ELECTRIC MFG. CORP.
Erie, Pa.

SPECIALIZED DESIGN
Pelham
UNEXCELLED QUALITY

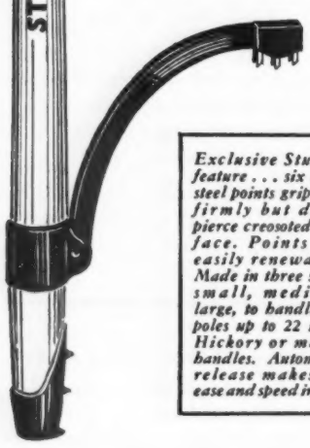
SWITCHBOARDS • PANEL BOARDS
SWITCH GEAR AND ACCESSORIES

THESE 6 LITTLE POINTS will help you get Longer Pole Life

• These six little ½ in. x ¼ in. steel points on the Multipoint Cant Hook take a sure, firm grip on any pole from the smallest up to the big 22-inch ones. They make no deep stab through the pole's creosote surface treatment to let in moisture and air which encourage rot. With automatic release for quick action, the SturdE Multipoint Cant Hook is easy to use; crews like the steady, firm grip it takes and *holds.*

This SturdE Multipoint Cant Hook is being specified by more and more utilities because it is a real time and money saver. Manufactured by The American Fork and Hoe Company, Cleveland, Ohio, Makers of True Temper Products.

STURDETOOLS
a **TRUE TEMPER PRODUCT**



Exclusive SturdE feature . . . six little steel points grip pole firmly but don't pierce creosoted surface. Points are easily renewable. Made in three sizes, small, medium, large, to handle all poles up to 22 inch. Hickory or maple handles. Automatic release makes for ease and speed in use.

Distributed by
JOSLYN MFG. & SUPPLY COMPANY
20 North Wacker Drive • Chicago, Illinois
Branches and Warehouses with Complete Stocks in Principal Cities of the United States

FIELD REPORTS ON BUSINESS

Despite lack of materials, industry on the whole is operating at an encouraging level. Interest in converting radio broadcasting stations now in service for operation on FM is gaining. Frozen food locker installations are mounting.

NEW ENGLAND

Stone & Webster Engineering Corp., Boston, has received a contract to design and build a 30,000-kw. steam plant for the Tampa (Fla.) Electric Co. With an immediate start on construction, completion is expected in 1948. A 66-kv. wooden pole line about 4 miles in length will be built to supplement service to Attleboro (Mass.) from the New England Power system. Western Massachusetts Electric Co., Springfield, Mass., has purchased a Worthington 105 cfm., 100 psi. compressor trailer unit for the distribution department.

Frozen food locker installations are mounting here with restaurants and institutions providing for this type of unit. Last week CPA granted permits for contracts amounting to about $12,000 for refrigeration boxes.

Despite lack of materials, New England industry, on the whole, is operating at an encouraging level. Municipal light department, Peabody, Mass., plans to rehabilitate its steam plant this summer. A Connecticut company has closed an order to supply the Ordnance Department with electric furnace parts at a cost of $5,000. Small switches in lots averaging $1,200, cartridge fuses, and lighting fixtures in small lots attracted attention on U. S. Navy supply schedules last week.

Westinghouse Electric's East Springfield (Mass.) plant has reached 50 percent of its December, 1945, pre-strike production, 3,700 of its former 5,500 employees are at work, others are being added as production gains, and about 7,000 will be employed after buildings now under construction are completed.

CHICAGO

Present estimates are that fewer than 3,000 homes will be built in Chicago this year under present market and government restriction conditions. Since October, the cost of building a small home in this area has risen at least 30 percent, due, in part, to the fact that prior to March 25, when new restrictions on building were issued, industrial and commercial builders took 60 percent of available labor and 70 percent of materials. The value of all construction authorized by the Civilian Production Administration in this district totaled $33,380,000 from the start of the program through May 15, but in the same period an almost equal number and amount were denied.

Some Chicago radio manufacturers will make as high as 80 percent of unit output in the form of combination radio-phonograph sets to meet a tremendous current demand. Actual production, however, is small because parts are difficult to obtain—particularly phonograph parts. Electric motors and wood cabinets are the principal bottlenecks. Zenith expects to have 45 percent of dollar volume in combination sets, against 39 percent in 1942 and still lower percentages in earlier years.

Sola Electric Co. will build a factory building in Cicero. A five-story assembly plant is planned by Automatic Electric Co., Chicago, at an estimated $60,000.

NEW YORK

Promotion activities designed for long-term pull and sales aids for lamps, small and major appliance and radios began to flood the trade in the last two weeks and their immediate effect was staggering. Some concerns are tapering off these activities as a result until immediate supplies are in greater volume.

One company, Schick Shaver, in opening its 1946 sales program, offered a "deal" composed of the standard razor and a holder which has an automatic switch. The combination was to be offered for a 30-day period, but the instant response was so great that the "deal" was cancelled at the end of the first week.

Displays and promotion material for lamps and appliances are being distributed to the retailers. The general consensus is that the material is well planned and well developed, but some important factors are questioning the timing of this type of material.

RCA presented its distributors with store fixture plans designed for the self-servicing of radio tubes and parts. The company expects this type of fixture to up sales between 25 and 35 percent.

Activity in facsimile transmission of news and pictures continues to increase and will complement both newspaper and radio coverage. Stations WMGM and WGHF, both in New York City, will soon install Finch equipment for that purpose.

PACIFIC COAST

Despite material shortages and stringent allocation of all stable electrical construction material, wholesalers report May business volume as good and that incoming stock shipments would appear to far better advantage if they were not contrasted with the tremendous backlog of orders awaiting them.

The Westinghouse factory at Emeryville, Calif., which assembles motors, generators, and transformers and manufactures panels and room heaters is steadily moving back into production after the 117-day strike, but as any maintenance conditioning was also picketed, only a portion of its normal crew is so far at work.

Necessary standards and wiring material, though still on wholesalers' allocation lists, are considerably easier since recent price increases stimulated production, though leaded parkway and service entrance cable have been figured at 26 to 30 weeks delivery.

The heavy machinery and disconnects, arresters, and substation equipment of a dozen government projects, now close to purchasing stage after many postponements of bidding dates, are augmented by such planned expansion as that of Pacific Gas & Electric Co.'s 80,000-hp. steam generating plant and requisite substations in Lower California Central Valley near Bakersfield, costing $10,000,000; and Southern California Edison's new 120,000-kw. steam plant at Redondo Beach to cost $15,000,000 and for which a 60,000-kw. generator has been ordered each from General Electric and Westinghouse.

N.E.W.A. Suggests Standards For Electrical Catalogs

A four-page printed folder, presenting complete details of dimensional and typographical layout for a "Suggested Standard Page" to provide uniformity and "practical workability" in catalogs used by salesmen of electrical wholesalers, has just been released by the National Electrical Wholesalers Association, 500 Fifth Ave., New York City.

The "Suggested Standard Page" is the first step in a comprehensive program being developed by N.E.W.A.'s catalog committee, of which A. C. Prange, General Electric Supply Corp., is chairman. A promotional folder to be published later this year will deal with the proper organization of material in wholesaler salesmen's catalogs. The folder requests the "cooperation of all manufacturers in helping to make the wholesaler salesmen's catalog the compact and organized medium it must be for efficient, on-the-spot selling." It also states that "of all the post-war selling 'tools' the catalog is right out in front. It has to work and be workable."

Concluding pages carry specific suggestions for both manufacturers and wholesalers. In introducing this material the folder points out that: "An inefficient typist uses the 'hunt and punch' system. A wholesaler's salesman, equipped with an inefficient catalog, would be forced to use the 'hunt and no punch' system."

•

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following assignments to their sales staffs:

THOMAS & BETTS CO., INC., Elizabeth, N. J., has appointed Fred M. Shepard as district manager of its Cleveland territory and Wyman Elliot as district manager of its Atlanta office.

AJAX ELECTRIC CO., INC., Philadelphia, has appointed A. A. Gustafson sales engineer. Mr. Gustafson will maintain offices at 2580 University Ave., St. Paul 4, Minn., from which he will cover Minnesota, North and South Dakota and northern Wisconsin.

ALLIANCE MANUFACTURING CO., Alliance, Ohio, has appointed Porter Turner field engineer in the New York and Philadelphia territory, with headquarters at 401 Broadway, New York. Harold A. Chamberlin has been made field engineer in the New England territory, with offices at 31 Milk St., Boston, Mass.

DAVEY COMPRESSOR CO. has appointed the H. W. Lewis Equipment Co., San Antonio, as distributors for southern Texas.

•

Holdenline Co. Moves

Address of Holdenline Co. has been changed from 1960 East 57th St., to 2301 Scranton Road, Cleveland 13, Ohio.

DEAD ACCURATE EASY TO USE

Takes out guesswork of "sight and sag", or oscillation wire stringing. Hooked on in a jiffy. Indicates tension in seconds. Measures only 8¼" x 6¼" x 3". Capacities 500 to 20,000 lbs.

A Lot of Critical Testing to Do

MAKE SURE WITH THE DILLON DYNAMOMETER

The Dillon is universally used in telephone work. Accuracy, and long-lived dependability are the answers. Indicates exact tension in guy strand, messenger and wire.

Many other uses where pull, torque, weight or overload are vital factors.

Write, wire or phone for illustrated Dynamometer Manual.

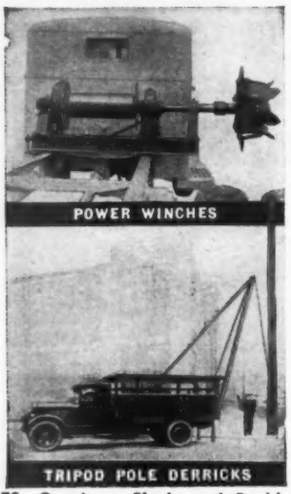
W. C. Dillon & Co., Inc.
5423 W. HARRISON ST., CHICAGO 44, ILL.

Specify ADVANCE BALLASTS
FOR UNEXCELLED PERFORMANCE

Leading manufacturers of lighting fixtures use and recommend "ADVANCE" Ballasts for QUIET operation, high efficiency performance, low replacement cost and long life. "ADVANCE" Ballasts are streamlined for easy installation in fixtures and are approved by Underwriters Laboratories.

ADVANCE TRANSFORMER CO.
Cable Address: ADTRANS
1108 W. Catalpa Ave. Chicago 40, Ill., U. S. A.

PIONEER MFRS. OF
Truck Winch & Crane Equipment
FOR PUBLIC UTILITIES
OUR 28th YEAR—1918-1946



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches, 2,000 to 50,000 lb. Cap.
POLE SETTING DERRICKS, TOWERS, CRANES, etc.
TYPICAL USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Virginia P. S. Co.; Consolidated Edison Co.; Ohio Power Co.; Texas Power & Light Corp., etc.
Send for Catalog No. 60

Agents in Principal Cities
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
862-63rd ST., BROOKLYN 20, N. Y.

Solves the Problem of Mailing List Maintenance!

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance during this period of unparalleled change in industrial personnel.

McGraw-Hill Mailing Lists cover most major industries. They are compiled from exclusive sources, and are based on hundreds of thousands of mail questionnaires and the reports of a nation-wide field staff. All names are guaranteed accurate within 2%.

When planning your direct mail advertising and sales promotion, consider this unique and economical service in relation to your product. Details on request.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd St., New York, 18, N. Y.

SALES OPPORTUNITIES

OHIO—Cleveland Electric Illuminating Co., Cleveland, has completed plans for new multi-story addition to generating station on Canal Road for expansion in steam division. Work on superstructure will begin soon. Additional equipment will be installed for increased capacity. Cost reported in excess of $750,000.

TENNESSEE—Public Utilities Department, Sweetwater, plans extensions in primary and secondary lines for rural electrification in parts of McMinn County, including line transformers, service connections and other facilities. Bids scheduled to be asked soon. Cost estimated close to $200,000.

WASHINGTON—Puget Sound Pulp & Timber Co., Bellingham, plans new pulp mill, 120 by 500 ft., on Laurel St., with machinery and electrical equipment for capacity of about 50 tons per day. Cost over $500,000.

CALIFORNIA—Southern California Edison Co., Los Angeles, is having plans prepared by Stone & Webster Engineering Corp., 601 West Fifth St., Los Angeles, consulting engineer, for proposed new steam-electric generating station at Redondo Beach, on site of former power plant operated by company at that place, and bids for erection are scheduled to be asked in near future. Plant will be equipped for initial capacity of 120,000 kw., divided into two 60,000-kw. units, one each to be furnished by General Electric Co., and Westinghouse Electric Corp.; awards for boilers and other primary equipment also are being made and further contracts will be let for other required equipment in near future. It is expected to have plant completed for operation of one generator by fall of 1947. Large switchyard will be built, with extensions in transmission lines. Estimated immediate cost is placed at $15,000,000, with ultimate expenditure considerably in excess of that amount.

IOWA—Town Council, Grimes, will receive bids until 7 p.m., June 20, for extensions and improvements in municipal power plant, including installation of 120-bhp. diesel engine-generator unit with accessories, voltage regulator, switchboard, instruments, etc. Ralph W. Gearhart, 349 21st St., Cedar Rapids, is consulting engineer.

PENNSYLVANIA — Pennsylvania Power & Light Co., Allentown, plans extensions in transmission lines using steel towers, for which contract for considerable tonnage of structural steel will be placed soon.

OKLAHOMA—Municipal Light and Water Department, Perry, plans extensions in street-lighting system, including ornamental lighting units in business district. Estimates of cost will be made soon. Proposed to hold special election in August to vote bonds.

MARYLAND—Crown Cork & Seal Co., Eastern Ave. and Cresson St., Baltimore, has approved plans for new one-story building at 1200 South Newkirk St., 450 by 570 ft., with machinery and electrical equipment for large capacity. Cost about $800,000. Erection will begin soon.

MISSOURI—Municipal Utilities Department, Carrollton, plans expansion and improvements in municipal power plant, including installation of new diesel engine-generating unit and auxiliary equipment. Cost estimated about $100,000. Special election will be held to approve bond issue in that amount.

WASHINGTON—Bureau of Reclamation, Denver, Colo., will receive bids until July 2 for structural steel framing for 115-kv. switchyard for Unit L-9, Grand Coulee power plant, Columbia Basin project (Specifications 1360).

CALIFORNIA—City Clerk, City Hall, Pasadena, will receive bids until June 26 for indoor metalclad switchgear, consisting of four 2,000-amp. air current circuit breakers, fourteen 600-amp. air circuit breakers, bus, instrument transformers and auxiliaries; also, similar switchgear, consisting of one 1,200-amp. circuit breaker, seven transfer switching units, instrument transformers and accessories; and enclosing relays for operating 14 circuit breakers noted, all for installation in power substation at Santa Anita.

TEXAS—Public Service Board, San Antonio, has engaged Gibbs & Hill, Inc., 450 Seventh Ave., New York, N. Y., consulting engineer, to prepare plans for proposed expansion in municipal steam-electric generating station on Mission Rd., including addition to present building and installation of a 25,000-kw. turbine-generator, high-pressure boiler and auxiliary equipment. Switchyard will be enlarged and extensions made in transmission lines. Entire project estimated to cost approximately $3,000,000.

WASHINGTON — Crown-Zellerbach Corp., Camas, kraft and other papers, has secured permission from CPA, federal agency, to proceed with expansion program at local pulp and paper mill. Work will comprise large group of new one and multi-story buildings for digester room, washer house, screen room, bleaching plant, pulp mill units, paper-making mill and miscellaneous departments. Machinery and electrical equipment will be installed for large increased output. Project will be carried out over period of number of months and will represent total investment in excess of $10,000,000. Main offices are at 343 Sansome St., San Francisco, Calif.

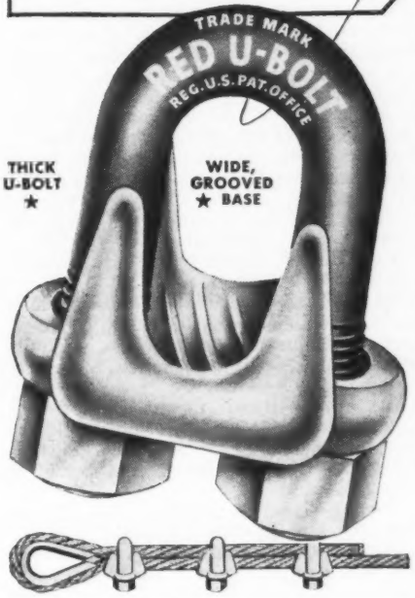
NORTH CAROLINA—City Council, New Bern, will receive bids until June 25 for extensions and improvements in municipal steam-electric generating station, with installation of additional equipment (Contract No. 2). Burns & McDonnell Engineering Co., 107 West Linwood Blvd., Kansas City, Mo., is consulting engineer.

MINNESOTA—Light and Power Commission, Willmar, is asking bids until 5 p.m., June 17, for 4,000-kw. turbine-generator and accessories, and surface condenser, 7,000-sq. ft. rating, for installation in municipal power plant, where expansion will be carried out. Pfeifer & Shultz, Wesley Temple Bldg., Minneapolis, are consulting engineers.

OKLAHOMA—Municipal Light and Water Department, Chelsea, plans extensions and improvements in distribution system. Proposed to arrange financing in part through federal aid.

The **CROSBY CLIP** *has a* **SOLID GRIP!**

Base fits lay of wire rope — holds firmer and without flattening strands. Available in sizes from 1/8" to 4". Sold everywhere. Manufactured by American Hoist & Derrick Co., St. Paul 1, Minnesota.



INSULATED PORTABLE LAMP

For generating plants, sub-stations, telephone exchanges and all work where a metal guard constitutes a hazard.

Shockproof, heavy duty construction.
Eliminates shorts to epuipment.
60-watt capacity; lamps easily replaced without tools.
Does not cast shadows.

WRITE FOR BULLETIN EW-66

Other products include tool, glove and line hose bags, signs, belts, climbers, etc.

IPCO — CATALOG ON REQUEST

Safety Equipment for all Industries

INDUSTRIAL PRODUCTS COMPANY

2808 N. FOURTH STREET · PHILADELPHIA 33, PA.

Recent Rate Changes

DAYTON POWER & LIGHT CO., Dayton, Ohio, has been authorized by the State Utilities Commission to cut its residential and commercial electric rates by $352,172 annually in its Dayton, Piqua, Preble, Washington Court House, Wilmington and Zenia divisions. It is estimated that the new rates will save residential users approximately $219,127 and commercial consumers $132,508 annually. The rate reduction became effective May 29.

DEMING ICE & ELECTRIC CO. has been ordered by the New Mexico Public Service Commission to reduce rates $61,500 annually, retroactive to last January 1.

LAS VEGAS LIGHT & POWER CO. has been ordered by the New Mexico Public Service Commission to cut rates beginning June 1 that will result in total reductions of $22,206.65 annually.

ARKANSAS-MISSOURI POWER CORP.'s new rate schedule, reducing residential consumers' rates $125,000 and rates of customers buying wholesale for resale, such as cooperatives, $50,000, (ELECTRICAL WORLD, May 25, Page 183) has been approved by the Arkansas Public Service Commission.

WORCESTER SUBURBAN ELECTRIC CO. has filed rate reduction schedules with the Massachusetts Department of Public Utilities under which residential and commercial users will save $46,500 per year beginning June 1.

LAWRENCE GAS & ELECTRIC CO. (Mass.) has announced a reduction of rates aggregating $50,000 per year, the fifth since 1941, according to R. H. Patterson, vice-president and manager. Domestic customers will receive $30,000 saving and commercial customers $20,000.

SAN DIEGO GAS & ELECTRIC CO. has been granted approval by the California Railroad Commission on extension of its power contract, including new rate modifications, with San Diego Electric Railway Co. until December 31, 1948. New base rates provided under the contract will be $1,215 monthly plus $1.50 per kilowatt a month demand charges and energy charges of 40 cents per kilowatt a month. Based on fuel oil prices of $1 per barrel and 16 cents per mcf. for natural gas, the rates provide for differentials of 1.6 cents per kilowatt-hour for each 5-cent variation of fuel oil above or below $1, in line with the late rise on fuel oil prices. On natural gas prices, 2 cents a kilowatt-hour provides for each 1-cent variation.

FALL RIVER RURAL ELECTRIC COOPERATIVE, INC., of Ashton, Idaho, has reduced its electric rates $4,000 per year, according to Lee A. Steck, manager of the co-op. Beginning in May rates were cut 50 cents per member per month to bring about a new minimum of $3.25 instead of the previous $3.75. The rate change will apply to all members who have been on service for longer than the initial contract period.

MIDWEST ELECTRIC, INC., an REA co-op, St. Marys, Ohio, has announced a new schedule of rates effective for the energy consumed in April. The new scale is: first 30 kw.-hr., 7 cents per kilowatt-hour; next 31 kw.-hr., 5 cents per kilowatt-hour; next 60 kw.-hr., 3 cents per kilowatt-hour; next 80 kw.-hr., 2 cents per kilowatt-hour, and all over 200 kw.-hr., 1.75 cents a kilowatt-hour. Minimum rate was reduced from $3 to $2.50 per month.

MATTHEWS SECONDARY CUTOUTS.

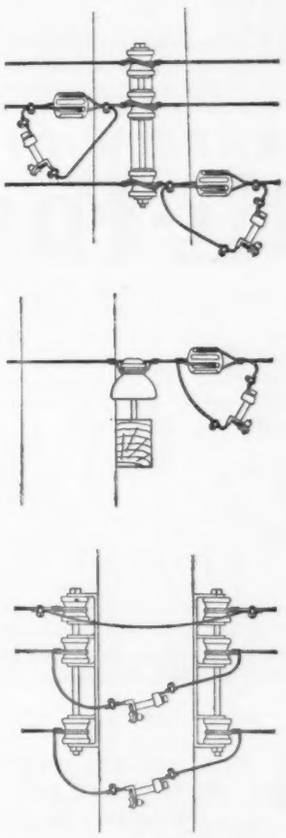
Rating:
100 Amperes 250 Volts
Rupturing Capacity
5000 Amperes

You can fuse them with any make of standard primary fuse links.

They indicate outages.

For isolating service entrance faults; for protecting banked transformer secondaries; or for protecting transformers from secondary faults, Matthews Secondary Cutouts have proved themselves very efficient and low-in-cost for many years.

For Sectionalizing as shown below.



Send for Bulletin 101-A.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.

BRAZE WITH

Sil-Fos

SIL-FOS brazed bus bar systems are tops in efficiency because this Handy & Harman patented low-temperature silver brazing alloy makes joints of one-piece strength and electrical conductivity.

Construction costs are low because elimination of bolts, drilling and assembly means big savings in materials and labor. Also, reduction in the amount of lap saves substantial amounts of copper. And remember, SIL-FOS joints won't oxidize, and never need tightening or cleaning—giving you a bus bar system that is virtually maintenance-free.

FOR FULL SIL-FOS FACTS
WRITE TODAY FOR
BULLETIN 12-A

HANDY & HARMAN
82 FULTON ST., NEW YORK 7, N. Y.
Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Calif.
Providence, R. I. • Toronto, Canada
Agents in Principal Cities

REA Announces New Allotments

The Rural Electrification Administration recently approved loans totaling $30,973,000 to 106 rural electric cooperatives for extension of service. Included are the following:

ALABAMA—Wiregrass Electric Cooperative, Inc., Hartford, $635,000; Coosa Valley Electric Cooperative, Talladega, $355,000.

ARIZONA—Graham County Electric Cooperative, Inc., Sanford, $295,000.

ARKANSAS—Arkansas Valley Electric Cooperative Corp., Ozark, $620,000; Ashley-Chicot Electric Cooperative, Inc., Hamburg, $190,000.

COLORADO—Morgan County Rural Electric Assn., Fort Morgan, $540,000; Union Rural Electric Assn., Inc., Brighton, $393,000.

FLORIDA—Sumter Electric Cooperative, Sumterville, $494,000; Central Electric Cooperative, Inc., Chiefland, $173,000.

GEORGIA—Central Georgia Electric Membership Corp., Jackson, $507,000; Walton Electric Membership Corp., Monroe, $341,000; Jackson Electric Membership Corp., Jefferson, $277,000; Snapping Shoals Electric Membership Corp., Covington, $221,000.

ILLINOIS—Menard Electric Cooperative, Petersburg, $500,000; Norris Electric Cooperative, Newton, $465,000; Edgar Electric Cooperative Assn., Paris, $325,000; Egyptian Electric Cooperative Assn., Steeleville, $280,000; Illinois Rural Electric Cooperative, Winchester, $175,000; Illinois Valley Electric Cooperative, Inc., Princeton, $160,000.

INDIANA—Jasper County Rural Electric Membership Corp., Rensselaer, $235,000; Miami-Cass County Rural Electric Membership Corp., Peru, $95,000.

IOWA—Federated Cooperative Power Assn., Hampton, $1,100,000; Central Electric Federated Cooperative Assn., Pocahontas, $550,000; Maquoketa Valley Rural Electric Cooperative, Anamosa, $255,000; Rideta Electric Cooperative, Inc., Mount Ayr, $150,000; Monona County Rural Electric Cooperative, Onewa, $80,000; Glidden Rural Electric Cooperative, Glidden, $77,000.

KANSAS—D.S.&O. Rural Electric Cooperative Assn., Inc., Solomon, $411,000; Flint Hills Rural Electric Cooperative Assn., Inc., Council Grove, $265,000; P.R. & W. Electric Cooperative Assn., Inc., Wamego, $238,000.

KENTUCKY—Jackson County Rural Electric Cooperative Corp., McKee, $670,000; Inter-County Rural Electric Cooperative Corp., Danville, $624,000; Hickman-Fulton Counties Rural Electric Cooperative Corp., Hickman, $331,000.

LOUISIANA—Claiborne Electric Cooperative, Inc., Homer, $470,000; Southwest Louisiana Electric Membership Corp., Lafayette, $204,000; Dixie Electric Membership Corp., Baton Rouge, $154,000; Teche Electric Cooperative, Inc., Centerville, $77,000; Northeast Louisiana Power Cooperative, Inc., Winnsboro, $55,000.

MAINE—Denny's River Electric Cooperative, Inc., Meddybemps, $44,000.

MICHIGAN—Tri-County Electric Cooperative, Portland, $72,000; Presque Isle County Electric Cooperative Assn., Onaway, $40,000.

MINNESOTA—Carlton County Cooperative Power Assn., Kettle River, $670,000.

MISSISSIPPI—Singing River Electric Power Assn., Lucedale, $685,000; Natchez Trace Electric Power Assn., Houston, $680,000.

MISSOURI—Northwest Missouri Electric Cooperative, Savannah, $270,000; New-Mac Electric Cooperative, Inc., Neosho, $266,000; Nodaway Worth Electric Cooperative, Inc., Maryville, $220,000; Laclede Electric Cooperative, Lebanon, $83,000.

MONTANA—Missoula Electric Cooperative, Inc., Missoula, $180,000; Beartooth Electric Cooperative, Inc., Red Lodge, $140,000; Park Electric Cooperative, Inc., Livingston, $65,000.

NEBRASKA—York County Public Power District, York, $361,000; Butler County Rural Public Power District, David City, $255,000; Wayne County Rural Public Power District, Wayne, $187,000; Custer County Public Power District, Broken Bow, $176,000.

NEW YORK—Steuben Rural Electric Cooperative, Inc., Bath, $50,000.

NORTH CAROLINA—Roanoke Electric Membership Corp., Rich Square, $490,000; Pee Dee Electric Membership Corp., Wadesboro, $441,000; Piedmont Electric Membership Corp., Hillsboro, $92,000; Four-County Electric Membership Corp., Burgaw, $73,000; Blue Ridge Electric Membership Corp., Lenoir, $50,000; South River Membership Corp., Stedman, $50,000; Surry-Yadkin Electric Membership Corp., Dobson, $50,000; Jones-Onslow Electric Membership Corp., Jacksonville, $44,000.

NORTH DAKOTA—West Plains Electric Cooperative, Inc., Dickinson, $500,000; Cass County Electric Cooperative, Inc., Kindred, $400,000.

OHIO—Adams Rural Electric Cooperative Inc., West Union, $233,000; Marion Rural Electric Cooperative, Inc., Marion, $45,000; Washington Electric Cooperative, Inc., Marietta, $40,000.

OKLAHOMA—Rural Electric Cooperative, Inc., Lindsay, $315,000; Northfork Electric Cooperative, Inc., Sayre, $138,000; Canadian Valley Electric Cooperative, Inc., Seminole, $129,000.

OREGON—Douglas County Electric Cooperative, Inc., Roseburg, $90,000.

PENNSYLVANIA—Northwestern Rural Electric Cooperative Assn, Inc., Cambridge Springs, $125,000; Central Rural Electric Cooperative Assn., Inc., Clearfield, $32,000.

SOUTH CAROLINA—Aiken Electric Cooperative, Inc., Aiken, $342,000; Horry Electric Cooperative, Inc., Conways, $240,000; Lynches River Electric Cooperative, Inc., Pageland, $50,000.

SOUTH DAKOTA—West River Electric Assn., Inc., Wall, $80,000; Lincoln-Union Electric Co., Alcester, $75,000.

TENNESSEE—Tennessee Valley Electric Cooperative, Savannah, $567,000; Sequachee Valley Electric Cooperative, So. Pittsburg, $545,000; Gibson County Electric Membership Corp., Trenton, $500,000; Appalachian Electric Cooperative, Jefferson City, $350,000; Forked Deer Electric Cooperative, Inc., Halls, $275,000; Tri-County Electric Membership Corp., Lafayette, $82,000.

TEXAS—Karnes Electric Cooperative, Inc., Karnes City, $260,000; Mid-South Electric Cooperative Assn., Navasota, $255,000; Taylor Electric Cooperative, Inc., Merkel, $223,000; Stamford Electric Cooperative, Inc., Stamford, $200,000; Swisher County Electric Cooperative, Inc., Tulia, $155,000; Belfalls Electric Cooperative, Inc., Rosebud, $145,000; Floyd County Rural Electric Cooperative, Inc., Floydada, $105,000; Lamb County Electric Cooperative, Inc., Littlefield, $100,000; Wood County Electric Cooperative, Inc., Quitman, $100,000; Navarro County Electric Cooperative, Inc., Corsicana, $50,000.

VIRGINIA—Mecklenburg Electric Cooperative, Chase City, $576,000; Northern Piedmont Electric Cooperative, Culpeper, $80,000.

WASHINGTON—Benton Rural Electric Assn., Prosser, $350,000; Columbia County Rural Electric Assn., Inc., Dayton, $330,000.

WISCONSIN—Dairyland Power Cooperative, LaCrosse, $3,380,000; Price Electric Cooperative, Inc., Phillips, $328,000; Grant Electric Cooperative, Lancaster, $290,000; Bayfield Electric Cooperative, Inc., Iron River $140,000.

BOOK REVIEWS

How to Find a Short By Jack Steele. Published by The Norman W. Henley Publishing Co., New York 19, N. Y. 209 pages, illustrated. Price $2.

Simple and highly practical, this book has specific information on recognizing and tracing wiring faults in automobiles. Diagrams for most recent cars and 50 case treatments put the utility-car driver in position to identify trouble and repair it out on the road and continue with his mission.

Building an Engineering Career. By Clement C. Williams. Published by McGraw-Hill Book Co., Inc., New York 18, N. Y. 309 pages, illustrated. Price $2.50.

Many an engineer has wished that he had had an orientation course when he committed himself to his current branch of engineering. Here he has just that in book form for his son or protege because it is the transcription of the lectures given over a six-year period by the author while president of Lehigh. It shows the place of engineers and engineering statistically and economically, defines the profession, its sphere and its objectives. As well as guiding the student in his choice it tells him how to study engineering (even how to pass exams and get a job). The latter half deals with the accomplishments and future potentialities of structural, civil, machine, thermal, transportive, electrical and chemical professions and industries. Not one engineer in a thousand would think of half the arguments and inspirations in this book if he were confronted with advising a youth intent on an engineering career.

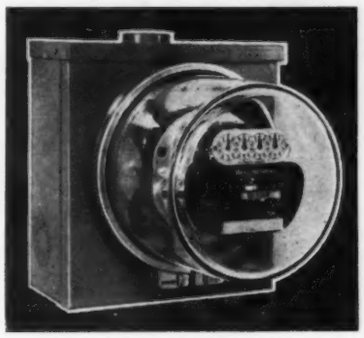
A Chronological History of Electrical Development. Published by National Electrical Manufacturers Association, New York, N. Y. 144 pages. Price $2.

Evolution of electrical science and technology is here portrayed in some 650 entries, beginning in 600 B.C., and recording the "firsts" in discovered phenomena, invented machines and applications established. It is thus an authentic source of dates and names in terse but adequate form. Emergence of publications and government bureaus is also included. In a separate list of some 500 entries the antecedents of the member companies of NEMA are recorded in terms of the name of the founder, the date and name of the initial company and its first president.

Lincoln Incentive System. By James F. Lincoln. A book in the Industrial Organization and Management series of the publisher, McGraw-Hill Book Co., Inc., New York 18, N. Y. 192 pages. Price $2.

When the word "incentive" is used in relation to industrial operations, it usually refers specifically and narrowly to means for spurring workers on to greater productivity. Here the emphasis is on incentive in reference to management because, as is logically developed in the book, management must understand and sincerely believe that continuing increase in productivity can only result from development of the skill and capacity of the worker, honestly rewarded, not in money alone, but also in appreciation of him as a human entity. Incentive management, as expounded by Lincoln, is a philosophy, not a method, a way of thinking, not a system. The book is a mixture of two themes. One is well documented exposition of the management philosophy so successfully demonstrated by the Lincoln Electric Co. The other is a presentation of the author's ideas on government and political economy. Both are interesting.

ANCHOR

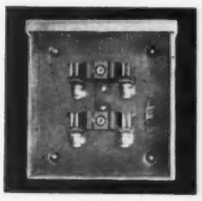


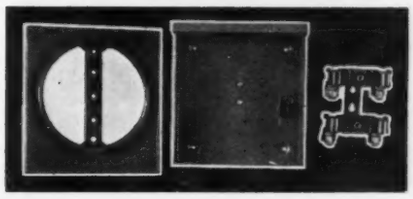
INTERMEDIATE SOCKET

For Type S Meters

OUTDOOR OR INDOOR

- Galvanealled Steel finished. Baked Gray Enamel.
  With 1" or 1¼" threaded outlet in top; knockouts in back, bottom and sides.
- Terminals take up to 1/0 wire.
- Correct alignment of meter jaws controlled by crossbar of removable ring.
- Complete interior removable to facilitate pulling of wires.



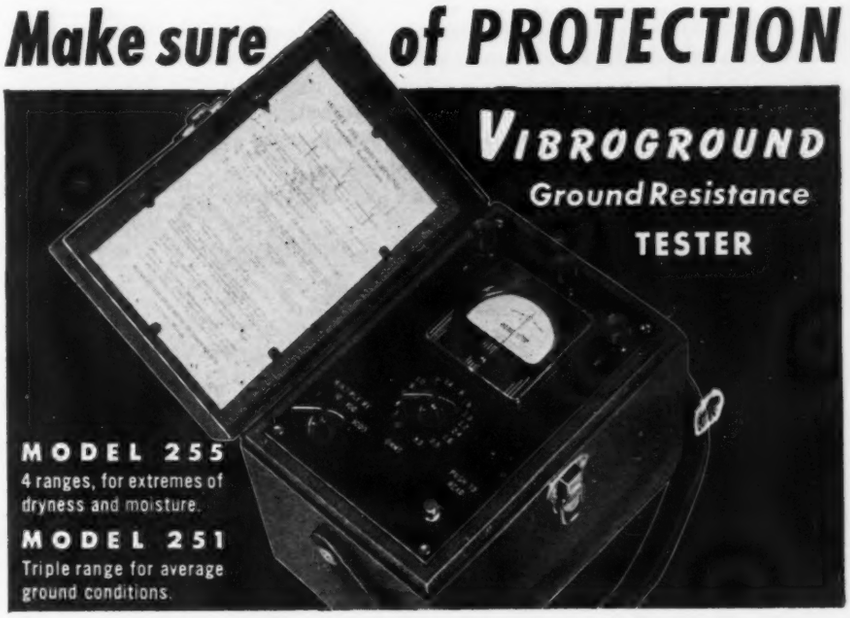


ANCHOR MANUFACTURING CO.

40 OLIVER ST., BOSTON 10, MASS.

PLANTS AT MANCHESTER & LAKEPORT, N. H.

Make sure of PROTECTION



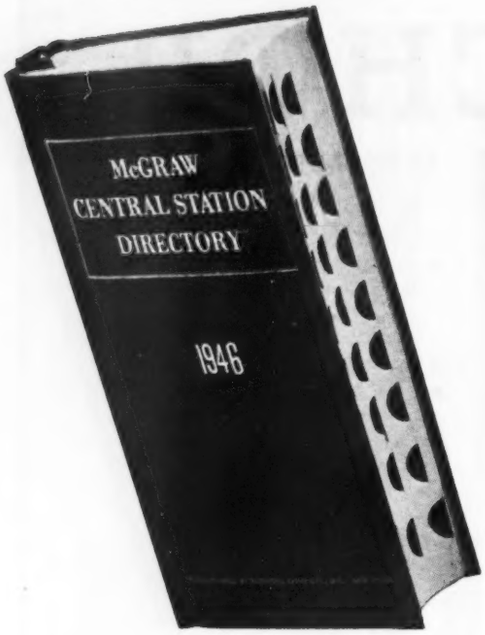
Protection to life and property are assured by frequent and accurate testing of resistance to earth, of man-made grounds. VIBROGROUND has long demonstrated its exceptional dependability. Not affected by prods, lead, nor frequency. AC or DC currents in ground do not distract from accuracy. No calculations required. Light. Portable. Easy one-man operation. Self-contained power source. NO CRANKING.

Send for fully descriptive Bulletin

ASSOCIATED RESEARCH, Inc.

221-C S. GREEN ST. **CHICAGO 7, ILL.**

Engineering Service Representatives in all Principal Cities



Presenting the 1946 edition of the

McGRAW CENTRAL STATION DIRECTORY

●

This latest, most accurate coverage of postwar changes in electric utility operations and personnel is published for those who work in or sell to the electrical utility industry.

●

The 1946 edition of the McGraw Central Station Directory, now ready, lists in one compact volume every discoverable change in the electric utility industry during the past 12 months. Changes in personnel and operations up to April 1, 1946 and other exclusive data on organization, areas served, generation and distribution equipment are included for each of 4,000-odd utility plants in the U. S., Canada and U. S. possessions.

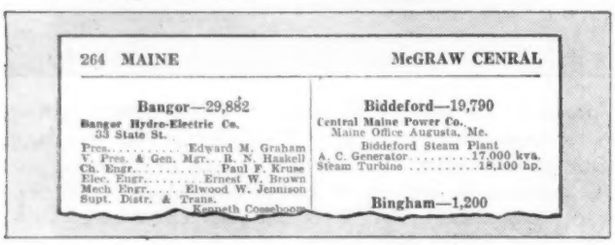
Facts Presented:

1. Names and addresses of private and municipally operated electric light and power companies in the U. S., Canada, and U. S. possessions; also government-controlled projects.

2. Names and addresses of affiliated, holding, controlling or managing and service companies with complete lists of properties controlled or managed by each, and including names and addresses of principal officials.

3. Names and addresses of officials and chief operating men for all operating companies, including:

- Presidents
- Vice Presidents
- General Managers
- Superintendents of Distribution
- Mechanical Engineers
- Commercial or New Business Managers
- Superintendents of Transmission
- Plant Superintendents
- General Superintendents
- Purchasing Agents
- Division or District Superintendents
- Chief Engineers
- Electrical Engineers
- Plant Engineers
- Merchandising Managers
- Division or District Managers



264 MAINE — McGRAW CENRAL

Bangor—29,882
Bangor Hydro-Electric Co.
33 State St.
Pres. ..... Edward M. Graham
V. Pres. & Gen. Mgr. .. R. N. Haskell
Ch. Engr. ..... Paul F. Kruse
Elec. Engr. ..... Ernest W. Brown
Mech. Engr. ..... Elwood W. Jennison
Supt. Distr. & Trans. ..... Kenneth Cosselmon

Biddeford—19,790
Central Maine Power Co.
Maine Office Augusta, Me.
Biddeford Steam Plant
A. C. Generator ..... 17,000 kva.
Steam Turbine ..... 18,100 hp.

Bingham—1,200

Sample page of Directory.

REA Co-ops Listed:

REA co-operatives have been listed separately in the back of the Directory. This list includes new co-operatives formed during the past year.

Use by Utilities:

The directory is used by hundreds of utility executives who wish to know about:

1. The organization of other utilities, especially those in their own or adjoining areas.
2. Movements of officials from company to company.
3. Discernible trends in expansions of operations of other utilities.

Use by Manufacturers:

Manufacturers of electrical generating, transmission and distribution equipment, and manufacturers of general equipment and supplies, all serving the vast utility industry, make constant use of the directory for

1. Names and addresses of executive, supervising, managing and engineering officials.
2. Determining electrical characteristics of plant, equipment and lines now in use.
3. Knowledge of scope of operations: generating capacity, towns and number of meters served, etc.
4. For each operating company, the following information is presented:

- Company total and plant individual generating capacity in kva. or kw.
- Kind of prime mover and capacity in hp.
- Amount of power purchased in kw hrs.
- Type of current distributed, No. of wires, phase, voltage and cycle.
- No. of meters served.
- Location of power plants.
- Complete list of towns (of 500 population or over) served.
- A complete alphabetical index of companies listed.

Edition Limited:

Shortage of paper and binding facilities necessitates limiting the 1946 edition. Orders will be filled in order of receipt. The Directory is sturdily bound in flexible blue Fabrikoid, fully thumb-indexed, size—4½″ x 8½″. Price $25.00 per copy. 10% discount on 5 or more copies. For intelligent, productive planning and selling, a copy of the 1946 edition of the McGraw Central Station Directory should be in the hands of every executive responsible for such plans.

Send orders to

Catalog & Directory Division
McGraw-Hill Publishing Company
330 West 42nd Street, New York 18, N. Y.

Answering your questions on

How ELECTRONIC DEVICES WORK IN INDUSTRY

. . . tubes
. . . circuits
. . . the split-second operations—
clearly diagrammed and explained in this detailed manual

● Here is what you want to know about the electronic devices used in your plant. The book gives you a quick look inside vacuum tubes—to complete tubes working in proven circuits. It shows you how each part of the circuit acts during the split second and reveals the real "magic" of electronics.

● Plain description is used throughout. No long words—no difficult math—no technical descriptions are used. Everything is explained clearly and carefully with the help of almost 300 diagrams. Every effort has been made to supply the user of electronic equipment with the facts he needs to help him better understand the equipment now serving in industrial plants.

Just Out

ELECTRONICS IN INDUSTRY

By GEORGE M. CHUTE
Application Engineer, General Electric Co., Detroit

403 pages, 6 x 9, 292 diagrams, $5.00

This book offers unusually thorough coverage of electronics. It supplies a much more detailed and simplified description of the subject than is normally given. Every type of electronics tube and tube-operated circuit is treated with completeness, from the simplest tube to the most complex circuits developed during the war and in wide use today.

These 28 chapters help you understand the industrial uses of electronics

1. Choosing electronics for your needs
2. How electricity passes through an electron tube
3. Control of electron flow within a tube
4. Time-delay action
5. Tubes in A-C circuits
6. The A-C time-delay relay
7. Kinds of high vacuum tube
8. Light and heat relays
9. Controlling large currents with tubes
10. Obtaining D-C power supply for tube circuits
11. Thyratron tubes
12. Resistance - welding controls
13. Gradual control of thyratrons by phase shifting
14. Heating and light-dimming controls
15. Tube control of a D-C motor
16. Arc-welding control
17. Voltage and speed regulators
18. Large - current rectifiers
19. High frequencies and shorter wave lengths
20. Inverters, oscillators and the electronic heater
21. Temperature recorders
22. High-speed light relays
23. Register controls
24. Thy-mo-trol — Automatic tube control of D-C motors
25. Thy-mo-trol for small motors
26. Regulators of welding voltage and current
27. Electronic service instruments
28. Non-electronic devices

For 10 days FREE TRIAL mail coupon

McGraw-Hill Book Co., 330 W. 42 St., New York City 18
Send me Chute—ELECTRONICS IN INDUSTRY for 10 days' examination on approval. In 10 days I will send $5.00, plus few cents postage, or return book postpaid. (Postage paid on cash order.)

Name .....
Address .....
City and State .....
Company .....
Position .....W. 6-8-46

For Canadian price, write to Embassy Book Co., 12 Richmond St. E., Toronto, 1

LETTER TO THE EDITOR

Infrared on the Farm

To the Editor of ELECTRICAL WORLD

Referring to the article, "Infrared—a Warm Friend for the Farmer," ELECTRICAL WORLD, April 27, 1946, page 49:

Myself being part farmer and part of Scottish ancestry, I like to think along lines of probable cost and hence I offer a hastily prepared tabulation of what I think one of these heating assemblies would represent in investment and in operation. I am assuming that the experiment indicated that for very low temperature days a group of eight of the 250-watt reflector-type heat lamps would be suitable, but that on milder days or for different jobs it might be suitable to use a fewer number, perhaps four lamps. On this basis I have assumed the use of eight lamps to burn one hour each day during a period of three months annually and half that many to burn one hour daily for five months. This, of course, is purely arbitrary but might represent a good guess as to probable usage.

Cost Data on Milk House Heating

1. *Investment*		
(a)	8 250 W R40 bulb, medium skirted base, 110- to 125-volt range reflector heat lamps @ $1.75 each list, less 25% in standard package quantities (of 12)	$10.50
(b)	1 Frame with 8 sockets (adjustable) and 2 switches, wired with #12 cable	15.00
(c)	Incidental hardware	.50
	Total	$26.00
2. *Operation, Annual*		
(a)	8 lamps using 2,000 watts total for 90 days, one hour daily, or total for 3 months of	180 kw.-hr.
(b)	4 lamps using 1,000 watts total for 150 days, one hour daily, or total for 5 months of	150 kw.-hr.
	Total Yearly Consumption	330 kw.-hr.
(c)	Electricity cost for 330 kw.-hr. @ 5¢ per kw.-hr.	$16.50
(d)	Lamp bulb renewal cost (average lamp life of two years including estimated breakage), or for 4 lamps each year	5.25
(e)	Interest and depreciation at 10%	2.60
	Total	$24.35

My rough estimate indicates that one of these frames complete represents an investment on the order of $25 and that on the basis of 5-cent power, the annual operating cost would be about the same figure. Naturally in addition to instantaneous heat there is certainty of abundant light. The only hazard would be to prevent a lamp bulb from coming into direct contact with straw, clothing, or refuse but that could easily be guarded against by the placement of the supporting frame or by the use of a wire guard around individual bulbs.

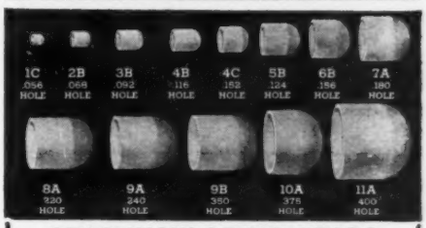
S. G. HIBBEN
Director of Applied Lighting, Westinghouse Electric Corp., Bloomfield, N. J.

CABLE-SPLICERS' WIPING CLOTHS

IMPROVED PATTERNS OF GREATER UTILITY
Formed-flexible Finishing Cloths. Catch Cloths. Crotch Cloths. New Type Cloth for Vertical Joints.

Send for literature and prices.

GEO. E. WILLIAMS, Mfr.
3035 Aldrich Ave. So.
Minneapolis, 8, Minn.



STAR INSULATING BEADS

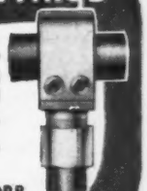
Use LAVOLAIN ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U.S.A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.

STAR PORCELAIN CO.
51 Muirhead Ave. Trenton, N. J.

STAR PORCELAIN COMPANY, Ltd.
49 MAIN ST., TORONTO 14, ONT.

Conductor Fittings

Service Connectors, Lugs, Tees, Grounding Clamps, Straight and Parallel Connectors, Elbows, Cable Taps, etc., etc.



PENN-UNION ELECTRIC CORP.
ERIE, PA.

PENN-UNION

Pole Marking For Quick Identification

POWER & LIGHT CO

Premax Metal Markers for utility poles and general property identification cut installation and upkeep costs. Send now for details.

Premax Products

Division Chisholm-Ryder Co., Inc.
4606 Highland Ave., Niagara Falls, N. Y.

PROFESSIONAL SERVICES

Associated Engineers, Inc.

Joseph C. Lewis, President

Management Consultants
Engineering . . Architecture - - Accounting
Organization - - Methods - - Costs.

230 E. Berry St., Fort Wayne 2, Ind.

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Rural Lines—Transmission Lines
Fire Alarms—Telephone Lines

48 Griswold St. Binghamton, N. Y.

CHAS. T. MAIN, INC.

Engineers

Boston, Mass.

Electric, Steam and Hydraulic Projects. Investigations, Reports, Designs and Appraisals.

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

FORD, BACON & DAVIS

ENGINEERS

DESIGN • CONSTRUCTION
VALUATIONS • REPORTS

New York • Philadelphia • Chicago • Los Angeles

J. H. MANNING & COMPANY

ENGINEERING
SERVICES

120 Broadway, New York

BLACK & VEATCH

Consulting Engineers

Water, Steam and Electric Power Investigations, Design, Supervision of Construction, Valuation, Tests and Laboratory Service.

4706 Broadway, Kansas City, Mo.

PAUL E. GERST & CO.

CONSULTING ENGINEERS

Specialists in
Electrical Product Design
El. Machinery, Apparatus & Applications
El. Appliances, Hi-Frequency Apparatus
Electronics, Radio Communications.

205 W. Wacker Dr. Chicago 6, Ill.

DANIEL W. MEAD
F. W. SCHEIDENHELM

Consulting Engineers

Hydro-Electric Development, Dams, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals.

New York City, 50 Church St.

E. J. CHENEY AND CO.

ENGINEERS AND CONSULTANTS

Economic and Business Surveys
Valuations and Reports
Rate and Rate Case Analyses

61 Broadway New York

GILBERT ASSOCIATES, Inc.

Engineers and Consultants

DESIGN, CONSTRUCT, OPERATE & MAINTAIN INDUSTRIALS AND PUBLIC UTILITIES

Reports • Rates • Labor relations • Safety • Purchasing • Costs • Laboratory

61 Broadway New York — Reading Pa. — 17 & Sansom Phila., Pa.
1417 K St. N.W. Washington, D. C.

ARTHUR L. MULLERGREN

Engineering-Management

Public Utilities—Natural Gas

Kansas City, Mo.

HUGH L. COOPER & CO. INC.

General Hydraulic Engineering, including the design, financing, construction and management of hydro-electric power plants.

350 Fifth Avenue New York 1, N. Y.

RAYBURN M. HAMILTON

Professional Engineer

711 Scanlon Bldg. Houston, Texas

PUBLIC UTILITY ENGINEERING & SERVICE CORPORATION

Consulting Engineers

Design Operations

Steam—Hydraulic—Gas

231 S. La Salle St. Chicago 4, Ill.

DAY & ZIMMERMANN, Inc.

ENGINEERS

Design - Construction - Management
Investigations and Reports

NEW YORK PHILADELPHIA Packard Building CHICAGO

FREDERIC R. HARRIS, INC.

ENGINEERS CONSTRUCTORS

MANAGEMENT
NEW YORK

Knoxville Houston San Francisco

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES
THE ONE-STEP METHOD
Bill Frequency Analyzer

102 Maiden Lane New York

DOBLE ENGINEERING COMPANY

Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications.

Office and Laboratory: Medford Hillside, Boston, Mass.

Branch Office: 20 N. Wacker Dr. Chicago, Ill.

HENKELS & McCOY

(Electric & Telephone Line Construction Co.)

Wood pole transmission lines
Electric Distribution and maintenance

Philadelphia, Pa.

SANDERSON & PORTER

ENGINEERS

AND

CONSTRUCTORS

Ebasco Services Incorporated

Design and Construction
Financial and Operating Consultation
Investigations and Reports
Consulting Engineering

Two Rector Street New York

HOOSIER ENGINEERING COMPANY

Erecting Engineers
Transmission Lines, Substations

46 So. 5th St., Columbus, Ohio
327 South LaSalle Street, Chicago, Ill.
136 Liberty St., New York

SARGENT & LUNDY

ENGINEERS

140 South Dearborn St.

Chicago, Ill.

ELECTRICAL TESTING LABORATORIES INC.

Specializing in

TECHNICAL SERVICES
to those intent upon good quality

2 East End Avenue at 79th St., New York 21, N.Y.

WILLIAM S. LEFFLER

succeeding
CHARLES F. LACOMBE—WILLIAM S. LEFFLER
Engineers—Economists
RATE RESEARCH — SALES RESEARCH
FOR
POST-WAR PLANNING
Cost Analysis Rate Cases
Noroton, Connecticut

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

H. F. FERGUSON

Consulting Electrical Engineer

Expert advice on location and purchase of right of way.
Industrial plant layouts & surveys. Rate comparisons.

288 Alameda Avenue Youngstown, Ohio

LUCAS & LUICK

ENGINEERS

DESIGN, CONSTRUCTION SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

WHITMAN, REQUARDT AND ASSOCIATES

ENGINEERS — CONSULTANTS
Power Plants — Industrial Plants
Steam and Electric Distribution Systems
Waterworks and Sewerage
Reports—Plans—Supervision—Appraisals

1304 St. Paul Street Baltimore 2, Md.